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ERRATA

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IMPERIAL BUREAU OF MYCOLOGY

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YOUNG (P. A.). **Tabulation of Alternaria and Macrosporium.**—*Mycologia*, xxi, 3, pp. 155–166, 1929.

To assist in the classification of the species of *Alternaria* and *Macrosporium* used by the author in his study of facultative parasitism [*R.A.M.*, vi, p. 111], he has prepared a table of all the described species in Saccardo's Sylloge, the first column of which contains the generic names of the hosts, the second contains the names of the host families, the third and fourth the length and breadth measurements of the spores in microns, while the fifth gives references to the descriptions of the species in the Sylloge.

A bibliography of 34 titles is appended.

POPOVA (Mme A. A.). О заболеваниях Табака **Nicotiana rustica L.** (Предварительное сообщение). [Diseases of the Tobacco *Nicotiana rustica* L. (Preliminary communication.)]—*Morbi Plantarum*, Leningrad, xviii, 1–2, pp. 45–53, 1929. [English summary.]

Investigations started in 1927 revealed the occurrence in the Ukraine of the following diseases of Indian tobacco (*Nicotiana rustica*) [a crop of considerable economic importance in Russia]. Preliminary work showed that the condition locally known as 'ryaboukha' [*R.A.M.*, viii, p. 612] is in reality due to various causes, some of which are still undetermined, and consists of different types of leaf spots which are provisionally classified as follows. (*a*) White leaf spot caused by *Phyllosticta tabaci*. This disease was first recorded in the Ukraine in 1914, since when it has attained a wide distribution; the losses caused by it at present are very appreciable, up to 25 per cent. of the plants being killed by the fungus in certain tobacco plantations. (*b*) Leaf spots of bacterial origin, strongly reminiscent of the American tobacco wildfire [*Bacterium tabacum*], and easily distinguishable from other spots in that at first they remain green, although of a paler shade than normal; later they dry up and become brown on the upper surface of the leaf, but retain a light green, chlorotic colour on the under side. Fresh spots contain large accumulations of rod-shaped bacteria which are now being identified. The infective nature of

this disease was demonstrated by successful needle inoculations. (*c*) The following types of leaf spots differ from the foregoing and from one another in macroscopical characters, but their causes have not yet been established. (1) Scab-like spots, at first ring-shaped with a green centre; as they grow older they enlarge, the centre becomes of a uniform brown colour with the rest of the affected tissue, and the whole spot assumes the form of a raised scab. (2) Rounded, white, isolated spots with a narrow dark margin which later broadens and becomes still darker, when the central tissue usually breaks away. (3) Deeply lobate spots along the main veins, at first green, later yellowing. (4) Star and crescent spots, outwardly very similar to those known under the same names in America. These spots are usually scattered (singly or in groups) along the leaf margins. (5) Shapeless, depressed, brown, non-zonate spots, which gradually whiten, appear to be covered with a pellicle, extend in size, and occasionally coalesce; the affected tissue usually dries up and falls out. (6) Rounded, light brown spots, the affected tissues dying off concentrically. These spots frequently involve the greater portion of the leaf surface, leading to the death of whole leaves. It is thought possible that some of these types are but different stages of one and the same disease.

Indian tobacco is occasionally affected with mosaic; and it may also be attacked very occasionally by *Peronospora hyoscyami*, which, however, has no economic importance in the region in question.

Among the stem diseases, the most prevalent is stated to be a collar rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*]. The disease is most dangerous in seed-beds, the entire destruction of which by the fungus has been recorded in several cases. In 1927 a slight outbreak of *Fusarium tabacivorum* Del. occurred; the main symptom was a well-marked constriction of the diseased stems at the collar, with the appearance on the surface of a pinkish efflorescence composed of falcate, hyaline spores with rounded ends. Most of the infected plants died. In 1928 the disease spread considerably in the affected plantation, from three well-defined infection foci. In the same year *Phyllosticta capsulicola* Sacc. was found attacking the seed capsules of *N. rustica* in another locality, this being stated to be a new record for the Ukraine; the fungus did not appear to do any appreciable damage. In seed capsules attacked by *Alternaria tenuis* the seed did not mature and its viability was very low.

Although rather widespread, the root rot caused by *Thielaviopsis basicola* appears to be of minor economic importance, except on the Schwitzent variety, about 10 per cent. of which was infected (with a high mortality) in certain plantations. *T. basicola* was also found parasitizing the haustoria of the broomrape (*Orobanche ramosa*) in the roots of the tobacco, to a much greater extent than the roots themselves. From the haustoria the infection spread upwards into the stems of *O. ramosa*, killing them before they seeded. The broomrape was much more heavily infected on manured soil, the highest percentage (80·5) being observed in plots fertilized with sulphate of ammonia, against 21·1 per cent. on non-manured plots. The possibility of the biological control of broomrape by means of *T. basicola* is now being investigated. *Fusarium*

orobanches was usually associated with this fungus on the broom-rape.

JOCHEMS (S. C. J.). **Verslag van een proef om door middel van sterilisatie met stoom zaadbedden vrij van slijmziekte te maken.** [Account of an experiment in the control of slime disease in seed-beds by means of steam sterilization.]—*Deli Proefstat. te Medan-Sumatra Vlugschr.* 48, 6 pp., 1 pl., 1929.

Absolute control of slime disease [*Bacterium solanacearum*: *R.A.M.*, viii, p. 74] has been obtained in 800 tobacco seed-beds on the Rotterdam B estate, Deli, Sumatra, by means of Bewley's 'box and grid' method of steam sterilization ('Diseases of Glasshouse Plants', 1923) [the use of which is briefly indicated]. For 15 minutes the temperature of the soil is maintained at 85° C., which suffices to destroy the slime disease organisms to a depth of 30 to 40 cm. Seedlings from beds thus treated were found to be fully equal in quality to naturally healthy material.

DARNELL-SMITH (G. P.). **Infection experiments with spores of blue mould disease of Tobacco.**—*Agric. Gaz. New South Wales*, xl, 6, pp. 407–408, 1929.

After expressing the opinion that blue mould of tobacco in Australia although sometimes identified with *Peronospora hyoscyami* may not be really identical with this fungus, the author states that artificial infection experiments conducted with the spores under sterile conditions at the Botanic Gardens, Sydney, showed that they germinated within twenty-four hours, and produced a strong germ-tube which penetrated the stomata, giving rise to numerous hyphae in the leaf tissues. A fresh crop of spores could be produced from an infected leaf within eight or nine days. The plants may become infected as soon as the two seed-leaves develop. Plants infected with blue mould also become liable to attack by *Bacterium solanacearum*; the gum pockets frequently noted in the stems of plants suffering from blue mould attack are probably associated with bacterial contamination. One infected plant in an isolated greenhouse produced a crop of spores in March, another in November, and a third in the March following. The native tobacco, *Nicotiana suaveolens*, was found to be liable to infection, as was a closely allied variety from Lord Howe Island, but infection experiments with *Solanum pseudocapsicum* and *S. sodomaeum* gave negative results.

VANINE (S. I.). Методы фитопатологического исследования грибных болезней леса и древесины. [Methods for the phytopathological investigation of fungal diseases of forest trees and timber.]—*Morbi Plantarum*, Leningrad, xvii, 3–4, pp. 129–152, 2 figs., 1928. [German summary. Received August, 1929.]

In this paper a brief outline is given of the methods that have been devised at the A. A. Jaczewski Phytopathological Laboratory in Leningrad for the phytopathological survey of forest trees and of timber materials, with special reference to diseases of fungal origin. Forest trees are divided into three classes, namely, nursery

seedlings, young plantations, and mature stands, and a general characterization is given of the diseases proper to each class, together with brief instructions regarding the methods for making records of the pathogenic organisms or other causes of disease, of their incidence, and all other relevant data. In respect of mature stands, the method adopted is a combination of the system used in private sylvicultural practice and that employed in state forest taxation practice. The rots of felled timber are considered under three headings, namely, industrial timber in storage, firewood, and constructional timber in buildings.

Westerdijk (Johanna) & Buisman (Christine). **De Iepenziekte. Rapport over het onderzoek verricht op verzoek van de Nederlandsche Heidemaatschappij.** [The Elm disease. Report on the investigation conducted at the request of the Dutch Moorland Society.]—78 pp., 15 pl., 9 figs.. Nederlandsche Maatschappij, Arnhem, 1929. [German summary.]

This is a fuller account of the authors' researches on the etiology, symptoms, incidence, and practical importance of the Dutch elm disease (*Graphium ulmi*) than that already published [*R.A.M.*, viii, p. 205]. Isolations from trees showing the typical symptoms have yielded only *G. ulmi* constantly. In the inoculation experiments carried out with *G. ulmi* on various species of elms, positive results were obtained, particularly between the beginning of June and the end of August, 1928, with *Ulmus campestris latifolia*, *U. c. monumentalis*, *U. c. suberosa*, *U. montana*, *U. m. dampieri aurea*, and *U. elliptica*. The leaves and twigs of 2- to 4-year-old trees often began to dry up in 10 days from inoculation. No difference in virulence was observed between the typical 'coremial' and the small-spored strains of the fungus. In 15 per cent. of the seedlings inoculated in 1928 infection was transmitted to the new 1929 wood.

It is pointed out that the period between early June and the middle of August is the most favourable for inoculation experiments, and further that the branches should be wounded in several places to facilitate the entrance of the spore suspensions into the tissues. Spraying the unwounded trees with spore suspensions did not result in infection, nor was the attempt at inoculation by brushing the leaves with spores successful. Under field conditions the fungus is believed to invade the trees primarily through small wounds inflicted by insects or mechanical agencies, though the possibility of penetration through natural wounds (flower and leaf scars) and apertures (stomata and lenticels) is not absolutely excluded. Large wounds (such as those due to cutting off branches) have not been observed to become infected, nor is there any indication that extensive infection through the leaf stomata occurs. Infection appears to be transmitted by the wind as well as by insects, the former probably being the chief factor in the spread of the disease, which has been observed to show a tendency to appear first, in new localities, in places exposed to the wind such as street corners and the like.

Direct control of the disease has not been found possible and the

eradication of diseased trees is only likely to be profitable where the disease is still in the sporadic stage. The discovery of immune varieties appears to offer the only hope of successful control.

Attention is drawn to the liability of confusion between the true elm disease and a somewhat similar condition caused by *Verticillium dahliae* [ibid., viii, p. 206 and next abstract]. This organism, however, produces fewer tyloses and gummy substances in the vessels than *G. ulmi*, and therefore the resulting brown discoloration is apt to be less intense in the former case. Spontaneous recovery was observed in some young elm trees inoculated with *V. dahliae*.

The rod-shaped bacterium isolated from elm branches showing the presence of sharply defined black stripes (a phenomenon observed also in England, Sweden, and Denmark) is named *Pseudomonas lignicola* n. sp. (with a diagnosis in German) [ibid., viii, p. 243]. The optimum temperature for the development of the organism was found to be about 25° C. It occurs singly or in short chains and is furnished with one or more polar cilia; gelatine is not liquefied nor nitrates reduced, neither is indol formed; growth on potato is yellowish-grey and fairly profuse. The discoloration caused by *P. lignicola* was noticed on *U. c. latifolia*, *U. c. monumentalis*, *U. c. van Houttei*, *U. montana*, *U. m. dampieri aurea*, and a *Zelkova* species. Inoculation experiments with this organism by various methods resulted in the development of discoloured stripes, but in no case was any withering of the foliage apparent. It is thought that in nature the bacteria enter principally through the leaf stomata. The inoculation of *Tilia euchlora*, *T. mongolica*, and *T. cordata*, *Crataegus oxyacantha*, and *Robinia pseud-acacia* with *P. lignicola* also resulted in the production of discolorations but no wilting.

A wilting and discoloration of the upper branches of *U. c. latifolia* is often accompanied by the presence of small cankers below the withered part, and by dead areas extending along the internodes of the cortex and bearing, at the end of May or beginning of June, the pustules of *Myxosporium ulmi*. The fungus isolated from the diseased material by the authors was, however, a species of *Phomopsis* with pycnidia containing pycnospores measuring 7·1 by 2·4 μ as well as the so-called β form (stylospores) [ibid., iii, p. 217], measuring about 25 by 1 μ. The final stage in some of the cultures was the development of perithecia of a species of *Diaporthe* closely related to *D. eres* Nitschke, but differing from the latter in the occurrence of small hooks on the ascospores. The attempt to produce the *Phomopsis* stage from the ascospores has not yet been made and the β-spores appear to be shorter than those described in the pycnidial stage of *D. eres*. The exact connexion between the *Myxosporium*, *Phomopsis*, and *Diaporthe* stages has, therefore, not yet been traced; inoculation experiments with the pycnospores have yielded inconclusive results.

Pythium intermedium [ibid., vi, p. 380] was isolated from the dark greenish-brown areas immediately below the cortex of the stem base of *U. c. latifolia*, and inoculated into the stems of healthy seedlings with positive results (production of cankers and long, black stripes).

WOLLENWEBER (H. W.). **Die Wirtelpilz-Welkekrankheit (Verticilliose) von Ulme, Ahorn und Linde usw.** [The whorl fungus wilt disease (verticilliosis) of Elm, Maple, and Lime, etc.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xvii, 3, pp. 273–299, 4 figs., 1929.

Isolated cases of verticilliosis caused by *Verticillium albo-atrum* have been observed in Germany on elms [*R.A.M.*, vii, p. 682 and preceding abstract], Norway maples (*Acer platanoides*), sycamores (*A. pseudo-platanus*), ash maples (*A. negundo*), limes (*Tilia*? *euchlora* and *T. cordata*), and horse chestnuts (*Aesculus hippocastanum*). This is apparently the first record of the disease on the two last-named genera.

The fungus isolated from these hosts was compared with specimens (mostly of German origin) obtained at various times from plants of twenty genera, including the above-mentioned hosts, celery, watermelon, beech, lupin, tomato, banana (West Indies), plum, cherry, gooseberry, currant, raspberry, eggplant (Minnesota), and potato. Most of the isolations agreed in morphological characters [which are described] and are considered to be specifically identical with the potato wilt organism, *V. albo-atrum* Reinke and Berthold. The forms described as *V. dahliae* by van der Meer [ibid., iv, p. 495] and as *V. ovatum* by Berkeley [ibid., v, p. 564] (cultures of which were examined) are also considered to be morphologically indistinguishable from *V. albo-atrum*. The presence or absence of sclerotia was found to be an unreliable character, though a few isolations were obtained in which sclerotia were not developed. Normally *V. albo-atrum* is considered to be a sclerotial fungus, and this is stated to be evident from the original description and figures.

Saccardo's diagnosis of this species is expanded to meet the new requirements arising out of these investigations. The rarer asclerotial *Verticillium* is termed var. *caespitosum*, the pale form without black sclerotia forma *pallens*, the thermophile organism isolated from bananas is named var. *medium*, an asclerotial *Verticillium* with true chlamydospores isolated from *Ulmus campestris* in Rome and from diseased celery root-stocks at Giessen is designated var. *chlamydosporale*, while the species from lupins named by the writer (without description) *V. angustum* (*Angew. Bot.*, iv, p. 12, 1922) should be known as *V. albo-atrum* var. *chlamydosporale* forma *angustum*. A fungus with grey conidia isolated from wilted carnations (*Dianthus caryophyllus*) at Geisenheim (Rhine) in January, 1929, is provisionally named *V. cinerescens* [with a Latin diagnosis].

The *Verticillium* isolated from *T. parvifolia*, three species of *Acer*, gooseberry, and red currant produced the typical symptoms of wilt on inoculation into lime (*T. euchlora*) seedlings, while the fungus from lime also infected *A. negundo*.

BERTOTTI (F.). **Contribuzione allo studio delle muffe delle Castagne.** [A contribution to the study of moulds on Chestnuts.] —*La Difesa delle Piante*, vi, 3, pp. 6–8, 1929.

Experiments conducted to ascertain how chestnuts in storage

become infected, especially internally, with various moulds [*Penicillium* and *Mucor* spp.: cf. *R.A.M.*, viii, p. 614], showed that infections of the pulp are nearly always due to the penetration of the mycelium through the withered remains of the styles; internal contamination does not occur if fungal development on the outside of the chestnuts is inhibited. The amount of external mould formed is closely related to the condition of the tissues of the enclosed cotyledons; if these are weakened, water and other substances (which probably have a stimulatory effect) may by osmosis reach the surface of the fruit and favour further moulding.

Tests by immersion in and spraying with numerous [named] chemical disinfectants either gave no control of fungal development or adversely affected the appearance of the fruit.

FERRARIS (T.). **Il mal del falchetto del Gelso.** ['Falchetto' disease of Mulberry.]—*Rivista Agricola*, xxv, 565, p. 286, 1929.

After referring to Petri's investigations into the disease of mulberries known in Italy as 'falchetto' [*R.A.M.*, viii, p. 207] and pointing out that the disease may exist as a slow, non-parasitic form or as a rapid wilt caused by infection of the collar by a fungus, probably a species of *Phytophthora*, the author states that the Ente Nazionale Serico, 17, Via Principe Umberto, Milan, offers prizes of 25,000, 7,000, and 3,000 lire for the best three essays received on the prevention and cure of the disease. Applications must be received before May, 1932, and essays submitted before 30th October in the same year.

NATTRASS (R. M.) & HUTCHINSON (H. P.). **'Black canker' of the basket Willow.**—*Journ. Min. Agric.*, xxxvi, 4, pp. 363–369, 7 figs., 1929.

A brief account is given in popular terms of the black canker disease of basket willows caused by *Physalospora miyabeana*, a more detailed description of which has already been noticed from another source [*R.A.M.*, viii, p. 274].

WIANT (J. S.). **The Rhizoctonia damping-off of conifers and its control by chemical treatment of the soil.**—*Cornell Agric. Exper. Stat. Memoir* 124, 64 pp., 6 pl., 6 figs., 1929.

A full account is given in popular terms of investigations conducted from 1924 to 1927 at Ithaca, New York, and Keene, New Hampshire, into the damping-off of conifer seedlings [*R.A.M.*, vii, p. 413], the history, prevalence, etiology, and control of the disease being dealt with under separate headings.

Isolations from diseased seedlings showed that the vast majority of *Pythium* and *Rhizoctonia* strains isolated were highly virulent to conifer seedlings: the evidence obtained from isolation, inoculation, and reinoculation studies [which are described in detail] demonstrated conclusively that *Rhizoctonia* was the principal pathogen. Strains of *Fusarium* and *Alternaria* were also isolated, but in the few tests made inoculations with these gave negative results.

Cross-inoculation experiments with 13 strains of *Rhizoctonia*, of

which seven were isolated from conifers and six from vegetable seedlings, were made on pea, cabbage, sugar beet, eggplant, pepper [*Capsicum annuum*] and on seedlings of Austrian pine [*Pinus nigra* var. *austriaca*], red pine [*P. resinosa*], Colorado spruce [*Picea pungens*], Norway spruce [*P. excelsa*], and Scotch pine [*Pinus sylvestris*]. The results indicated wide differences between the strains in virulence on the various hosts, while in only a few cases did these differences appear to be related to the host species from which the strains were isolated. Cultural studies [which are described] of these and 10 other conifer strains of *Rhizoctonia* were made on four [named] media, but no correlation was established between the results of these and the cross-inoculations. With one possible exception isolated from *P. sylvestris*, all the strains were considered to fall within the limits of the species *R.* [*Corticium*] *solani*.

Experiments with various chemical disinfectants showed that single soil treatments at seeding time with liquid applications of aluminium sulphate, mercuric chloride, semesan, sulphuric acid, or uspulun, or with dry applications of aluminium sulphate, Bayer 11–6, mercuric chloride, or mercurous chloride were equally effective in controlling damping-off of Norway spruce, red pine, and white pine (*P. strobus*). Bayer dust and dipdust were less satisfactory, but semesan bel and semesan jr. dusts were effective in the limited number of tests made. The rates of application recommended, together with the cost of the above-named disinfectants, are tabulated. Aluminium sulphate, used at the rate of about 10 to 14 gm. per square foot either dry or in solution in 500 c.c. water, was the least expensive. The results obtained indicated definitely that some of the chemicals exerted not only a disinfecting action when applied, but also had a protective action during and after the emergence of the seedlings.

White Pine blister rust control.—*Third Bienn. Rept. Michigan Dept. of Agric. for the fiscal years ending June 30, 1927 and 1928*, pp. 49–50, 1 map, 1928. [Received 1929.]

Since 1st July, 1927, white pine blister rust [*Cronartium ribicola*] control in Michigan has, by a joint arrangement between the Federal and State Departments of Agriculture, been placed in charge of a blister rust control agent on a yearly basis under the supervision of the Division of Orchard and Nursery Inspection. Before that date only two counties (Oakland and Kent) were known to be infected, and no rust was found after 1923. Now, however, the situation is becoming more serious each year owing to the prevalence of the disease in Wisconsin, Minnesota, and Ontario and to the capacity of the spores of the fungus to spread to distances of 100 to 150 miles from pines to black currants [*R.A.M.*, viii, p. 617]. Recent inspections have disclosed new infections in another 16 counties extending from Lake Huron to Lake Michigan and northwards close to the forest nursery at Higgins Lake, and within infecting range from pine to *Ribes* of several valuable pine tracts. Blister rust control areas have been established round the State forest nurseries at Higgins Lake and East Lansing and the Federal nursery at East Tawas; within these areas no currants or

gooseberries may be grown. European black currants have been declared to constitute a public nuisance in the above-mentioned 16 counties [which are enumerated], the fungus having been found on this host in 52 out of 58 separate localities.

MONTEITH (J.) & HOLLOWELL (E. A.). **Pathological symptoms in legumes caused by the Potato leaf. hopper.**—*Journ. Agric. Res.*, xxxviii, 12, pp. 649–677, 1 pl., 13 figs., 1929.

This is a detailed report of experiments which were conducted in 1927 at Rosslyn, Virginia, and Urbana, Illinois, to determine the symptoms and extent of injuries caused by the potato leafhopper (*Empoasca fabae*) to forage and other legumes, including cowpea, soy-bean, lotus (*Lotus corniculatus*), and French beans [cf. *R.A.M.*, vi, p. 731]. The injury, which is manifested by tip and marginal browning of the leaves, reddening or bronzing of green parts, and dwarfing and curling of the plants, is apparently due to some disturbance of the metabolic processes due to injection of an enzyme or toxin which remains localized to a part of the plant.

KNOWLTON (G. F.). **The Beet leafhopper in Utah. A study of its distribution and the occurrence of curly top.**—*Utah Agric. Exper. Stat. Bull.* 205, 23 pp., 10 figs., 1 map, 1928. [Received September, 1929.]

This is a popular account of the part played by the beet leafhopper (*Eutettix tenella*) in the transmission of curly top of beets in Utah [*R.A.M.*, vii, p. 136; viii, p. 693], accompanied by tables showing the seasonal abundance of the insect in relation to the incidence of disease. Lists are also given of the localities in which *E. tenella* has been collected and of its host plants, together with notes on the life-history of the insect.

COONS (G. H.) & STEWART (D.). **Sugar Beet leaf spot controlled by dusting from an auto truck.**—*U.S. Dept. of Agric., Yearbook of Agric. 1928*, pp. 560–561, 1 fig., 1929.

Leaf spot of sugar beets (*Cercospora beticola*) has been successfully controlled at Rocky Ford, Colorado, by four or five applications, at ten-day intervals beginning when the crop was about two months old, of a dust containing dehydrated copper sulphate (20 per cent.) and hydrated lime (80 per cent.). In order to extend the area of the dusting operations and at the same time to accelerate the work, a commercial duster driven by a gasoline engine was mounted on a motor truck with a tread of 56 inches, which ran between the rows without injuring the plants in fields where the beets were planted in 20-inch rows—the usual spacing in the Arkansas Valley. The apparatus is less suitable for the occasional fields with 22- and 24-inch spacing. The truck can be driven at the rate of 7 to 10 miles an hour through the fields, eight rows being dusted at a time. Wheel guards of galvanized sheet iron are fitted to the front and sides of the wheels to turn back the leaves, and a canvas apron trailing behind serves to check the dissipation of the dust by wind.

RÖSNER (H.). **Einflüsse von Rübenkrankheiten auf die Verfärbung der Säfte.** [Effects of Beet diseases on the discoloration of the juices.]—*Centralbl. für Zuckerind.*, xxxvii, 27, pp. 26–27, 1929.

Technical details, accompanied by statistical data in tabular form, are given concerning a dark discoloration of sugar beet juices observed at the Glogau (Silesia) sugar factory as a result of heart leaf rot [*R.A.M.*, viii, p. 217] and girth scab [*Actinomyces* sp.: ibid., viii, p. 9]. The estimated reduction of the sugar content of beets affected by heart leaf rot is 1·4 per cent., the corresponding figure for those attacked by girth scab being 4 per cent. The dark discoloration of the juice was found to be due to the presence of a pigment which was not eliminated by the Weissberg process of purification.

HÜLSENBERG (H.). **Die eckige Blattfleckenkrankheit der Gurken (Pseudomonas lachrymans Sm. and Br.), eine für Deutschland neue Gurkenerkrankung.** [The angular leaf spot of Cucumbers (*Pseudomonas lacrymans* Sm. and Br.), a Cucumber disease new to Germany.]—*Obst- und Gemüsebau*, lxxv, 7, pp. 139–140, 1929.

Popular notes are given on angular leaf spot of cucumbers (*Pseudomonas* [*Bacterium*] *lacrymans*), which was detected, apparently for the first time in Germany, in a nursery in Saxony about the middle of April, 1929.

UPPAL (B. N.). **India: mosaic disease of Chillies (Capsicum annuum) in the Bombay Presidency.**—*Internat. Bull. of Plant Protect.*, iii, 7, p. 99, 1929.

The chilli (*Capsicum annuum*) crop in the Bombay Presidency suffers heavy damage annually from an obscure disease manifested by a reduction of the leaf surface and other symptoms which have now been found to be due to a mosaic disease [*R.A.M.*, vii, p. 344]. The inoculation of healthy plants grown in insect-proof cages with the juice of diseased individuals gave positive results. Thrips have been shown to be the most effective agents for the transmission of the chilli virus.

NARASIMHAN (R.). **A preliminary note on a Fusarium parasitic on Bengal Gram (Cicer arietinum).**—*Madras Agric. Dept. Year Book, 1928*, pp. 5–11, 1 pl., 1929.

In January, 1928, specimens of wilted gram (*Cicer arietinum*) plants were received from the Bellary district, and about the same time a similar condition was observed on this crop at Coimbatore. An examination of the diseased plants revealed in some cases a species of *Fusarium* and in others a *Rhizoctonia* [*R.A.M.*, viii, p. 424].

The first symptom of the disease in the field is a drooping of the leaves, followed by pronounced wilting and necrosis of the tissues in the collar and main roots. Affected plants easily break away at the collar when pulled out of the soil, or the lateral roots may be broken and left behind.

The cultural and morphological characters of the *Fusarium* on different media are described. The hyaline, slightly curved conidia are usually non-septate, though up to four septa were occasionally observed. The average dimensions of the non-septate forms were 15 by 3·86 μ, the corresponding figures for the 1-, 2-, 3-, and 4-septate forms being 19·2 by 4·2 μ, 25 by 4·7 μ, 31·1 by 5·25 μ, and 42 by 4·9 μ, respectively. A few thick-walled, hyaline to light brown, piriform, elliptical, or spherical chlamydospores were found at the tips of the germ-tubes.

Healthy gram seedlings in sterile soil were inoculated by placing a pure culture of the *Fusarium* in contact with the unwounded collar, and also by mixing the fungus with the soil. Positive results were obtained in both cases. No infection was secured on cotton, cowpea, *Cajanus indicus*, *Crotalaria juncea*, *Sesamum indicum*, and *Hibiscus cannabinus*.

DUFRÉNOY (J.) & HÉDIN (L.). **La mosaïque des feuilles du Manioc au Cameroun.** [Mosaic of Cassava leaves in the Cameroons.] —*Rev. de Bot. Appliquée*, ix, 94, pp. 361–365, 1 pl., 1929.

A mosaic disease is stated to be present on nearly all varieties of cassava cultivated in the Cameroons. Affected plants are stunted while the diseased leaves are small and with lobes which are markedly asymmetrical in relation to the nervation. The healthy part of the blade develops more rapidly than the diseased portion and finally outgrows it, producing a curvature of the veins. At the stalk end, where the symptoms first appear, characteristic yellow spots become visible on the upper surface of the leaf, which also shows wart-like lesions. From material in the Dahlem Museum in Berlin this mosaic appears to have been confused with a disease caused by *Cercospora henningsii* [*R.A.M.*, vi, p. 341].

The disease is propagated by cuttings: in a field where both healthy and diseased plants were present all the stems grown from any one cutting were uniformly healthy or diseased. The varieties (except Ollaa) grown by the natives are more or less resistant. The disease seriously reduces the yield of the plants.

This mosaic appears to be prevalent over a large part of Western Africa, including Sierra Leone [ibid., vii, p. 304]. It is reported as having been present in the Ubangui district since 1924; at first it was limited to the roadside plantations, but by 1927 it was noted on all cassava plants however far from the roads. Ceara rubber (*Manihot glaziovii*) was also attacked, but not until two years after the disease was first seen on cassava. In the Cameroons it is present on cassava throughout the forest area, having progressed inland from the coast. In the savanna region of Batouri, where the annual rainfall is below 150 cm., large fields of cassava growing on lateritic soil were unaffected, but cuttings from this region when planted at Doumé gave rise to mosaic plants.

Control is being attempted by the use of resistant varieties.

ZERETELI (Mme L. J.). Грибы, собранные на Виноградной лозе в районе Сакарской Опытной Станции виноградарства и виноделия. [Fungi collected on the Vine in the district of the

Sakaro Experimental Station of Viticulture and Wine Making.] —*Scientific Papers Applied Sections of Tiflis Bot. Gard. 1929*, 6, pp. 91–96, 1929. [German summary.]

Of the eighteen species of saprophytic and parasitic fungi that have been so far recorded on the vine in the province of Imeretia [Georgia, Transcaucasia] and brief notes on which are given in this paper, the only two of economic importance are mildew (*Plasmopara viticola*) and *Oidium tuckeri* [*Uncinula necator*], both of which recur from year to year, sometimes reducing the crop by 50 per cent. The other parasitic fungi listed include *Guignardia* [*Physalospora*] *baccae* [*R.A.M.*, vi, pp. 76, 81, 207], *Mycosphaerella vitis*, *Phyllosticta viticola* in association with *P. vitis*, *P. ampelina*, *Coniothyrium diplodiella* [ibid., vii, p. 358], *Ascochyta ampelina*, *Hendersonia vitis*, *Septoria viticola*, *Alternaria vitis*, and *Epicoccum neglectum*.

Nagorny (P. I.) & Kantchaveli (L. A.). Главнейшие болезни Виноградной лозы в Кахетии в **1926** году. [Principal diseases of the Vine in Kakhetia in 1926.]—*Scientific Papers Applied Sections of Tiflis Bot. Gard. 1929*, 6, pp. 97–103, 1929. [English summary.]

The year 1926 was marked in Kakhetia [Transcaucasia] by an exceptionally early and heavy development of vine mildew (*Plasmopara viticola*), which, however, was almost confined to the leaves. No difference in susceptibility was noticed between local and west European vines. An almost equal degree of severity was attained by *Oidium tuckeri* [*Uncinula necator*], which mainly attacked the grapes and shoots, more rarely the leaves. The highest resistance to this fungus was shown by the French varieties Cabernet and Sémillon (15 and 12 per cent. infection, respectively), while local varieties were much more susceptible, especially Mtzvviane (90 per cent.). White rot (*Coniothyrium diplodiella*) was fairly severe in some localities. An especially heavy outbreak was noted in a vineyard after a severe hailstorm, the greatest damage being done in the rows at right angles to the direction of the wind. The incidence of white rot was from 1 to 3 per cent. in Aligoté, Mtzvviane, and Sémillon, progressively rising in other varieties (including Mtzvviane) to 35 per cent. in Rka-tziteli. *Guignardia* [*Physalospora*] *baccae* [see preceding abstract] was only present in two districts, and did comparatively little damage. Fairly numerous cases of apoplexy of the vine were recorded in several localities, particularly in the variety Mtzvviane, and more rarely in other varieties, e.g., Saperavi and Riesling. The authors point out the complexity of the causes, most of them yet undetermined, which may bring about this condition of the vine, and do not exclude the possibility of the local occurrence of the form caused by Viala's *Stereum necator* [*R.A.M.*, viii. p. 222], although this organism has not yet been found in Kakhetia. *Psathyrella ampelina* Viala et Foëx occurs all over the province on old stocks and young grafts only in the form of sterile mycelium [*Fibrillaria*]; fruiting bodies were, however, occasionally obtained in the laboratory. In the authors' opinion Viala's state-

ment that this fungus is not parasitic needs further confirmation, since in Kakhetia the mycelium was on several occasions found on stocks and young grafted plants exhibiting obvious pathological symptoms, such as chlorosis, abortive shoots, shortening of the internodes, and the like, in the absence of any other parasitic organism.

Vereșceaghin [Veresciaghin] (B.). Отчего погибаютъ наши виноградники? [What is the cause of our vineyards dying out?] —*Farnica 1929*, Chișinău [Kishineff], 6, 15th March, 1929.

The author states that this is the first official record of the 'esca' disease (*Stereum necator*) of the vine [see preceding abstract] in Rumania, where it has, so far, been found in two districts of Bessarabia but probably occurs elsewhere. After giving a brief description of the symptoms, he states that the greatest damage is done to the muscat, Traminer, and Plovai varieties, which are attacked at all stages of growth. Fructifications of the fungus have been observed on vine twigs in the form of wrinkled, flat bodies, several millimetres broad by up to 1 mm. thick, and of a slightly lighter colour than the bark. The control measure recommended is an abundant sprinkling of all vine stocks, immediately after pruning or early in the spring before the emergence of the buds, with the following mixture: 20 kg. arsenious acid, 15 kg. carbonate of soda, and 18 kg. soap in 100 l. water, which should be diluted 15 times before use.

Stapp (C.). **Zur Bekämpfung der Mauke der Reben.** [On the control of Vine 'mauke'.]—*Angew. Bot.*, xi, 3, pp. 333–341, 3 figs., 1929.

Directions are given for the control of the 'mauke' disease of the vine (*Pseudomonas* [*Bacterium*] *tumefaciens*) [*R.A.M.*, vii, p. 622; viii, p. 754], which is stated to be spreading extensively in Germany owing to the general use of grafts as a measure for reducing insect depredations. Young grafts (which are particularly susceptible to infection) should be protected by means of oiled paper covers extending along the stock from 5 to 15 cm. below to 5 to 10 cm. above the grafting-point, this area having previously been painted with a 50 per cent. solution of dendrin or 0·5 per cent. uspulun. Severely infected stocks should be eradicated or, if there is any possibility of the development of fresh shoots, cut back, the wounds being painted with carbolineum or some other disinfectant. Immediately before planting, the roots of the cuttings should be dipped in an uspulun-loam mixture [ibid., viii, p. 255].

Smolák (J.). **Botrytis a Monilia na Révě Vinné.** [Occurrence of *Botrytis* and *Monilia* on the Vine.]—*Ochrana Rostlin*, ix, 2, pp. 25–29, 3 figs., 1929.

The author states that in the climate of the north of Czecho-Slovakia *Botrytis cinerea* may frequently be found developing on all the aerial organs of the vine and causing a fairly severe rot of the ripening grapes, which it is capable of attacking through insect wounds. The fungus is particularly dangerous to ripe grapes meant for wine making, as the rot induced by it under local conditions, and especially in cool and rainy seasons, is acid and lowers

the flavour and keeping quality of the wine; furthermore, it destroys to a very noticeable degree the pigment in red grapes, thus greatly reducing the colour of red wines. In the south, however, where the climate is warmer and drier, the rot caused by *B. cinerea* appears to increase the sugar content of the grapes, and is often welcomed by the wine makers as conducive to a better quality of their wines.

Attention is called to an outbreak in 1928 in Melnik [north Czecho-Slovakia] of a rot of grapes caused by *Monilia* (*Sclerotinia*) *fructigena*, not on account of the damage done to the crop, which was small, but because this fungus has been so far very rarely, if at all, recorded on grapes. Observations should be made to see whether *S. fructigena* does not occur on grapes elsewhere in Czecho-Slovakia, since this outbreak may be the first sign of the development of a new biological form of the fungus, specialized to grapes, which in time might become highly injurious to the crop.

NAGORNY (P. I.). Материалы для микофлоры кавказской Виноградной лозы. **Fusarium viticolum Thuemen.** [Contribution to the fungal flora of the Caucasian Vine. *Fusarium viticolum* Thuemen.]—*Scientific Papers Applied Sections of Tiflis Bot. Gard. 1929*, 6, pp. 152–160, 1 fig., 1929. [German summary.]

The discovery in 1926 and 1927 of *Fusarium viticolum* [*F. viticola*: *R.A.M.*, vii, p. 74] on cuttings from certain American vine stocks and from local grafted vines in Georgia is stated to be a new record for the Caucasus, where the only representative of the genus hitherto known to occur on the vine was *F. zawianum* Sacc. The discovery is important in that the fungus is thought most probably to be the cause of the defective propagation observed of recent years in cuttings and grafts, which has led to heavy financial losses. In longitudinal section the pith of the affected cuttings shows from a few to many dark areas, 2 to 9 mm. in length, while towards the periphery of the wood a narrow, dark, continuous, sometimes branching line extends parallel to the long axis on each side of the section. In slanting sections across the stem there appears a series of dark brown or almost black spots of varying shape and size, forming an interrupted ring around the pith. The discolored tissues of the pith and wood are permeated by the mycelium of *F. viticola*; hyphae are also found in abundance in the phloem and bark, and on the surface of the cuttings. When a cutting is kept in a moist atmosphere at a temperature of 18° to 20° C., a delicate white mycelial web appears in a few days; this changes to a delicate pink, and later to a light yellow colour, when it assumes the consistency of a felted mat. At both the pink and yellow stages of development, an abundance of hyaline, straight, spindle-shaped, 1- to 4-septate conidia, measuring up to 37·5 by 4 μ, develop. The same abundant mycelial growth and production of conidia also occurs in pure culture. In water the conidia germinate in 12 to 20 hours.

In Georgia *F. viticola* was never seen on vine twigs during the active vegetative period, but has been repeatedly found on the mature vines collected for cuttings at the end of the season.

Attempts to inoculate through wounds the green vine shoots or the grafts at the moment when they have started to grow always gave negative results. On the other hand, the fungus has proved to be highly infective to cuttings in storage, particularly when kept in moist sand: a few diseased cuttings are quite sufficient to transmit the infection by contact to a whole parcel, frequently resulting in total loss. It was also shown that *F. viticola* may live for a long time on vine debris in damp soil. Hence great precautions are necessary in storing the cuttings for any length of time, as the infection is extremely rapid and may spread to a whole bed within a few days. The sand should be carefully sifted to free it from any plant debris, and spread out in a thin layer in the sunshine for several days. All diseased cuttings should be carefully removed and destroyed by fire. Surface sterilization of the cuttings with Bordeaux mixture or other fungicides is ineffective.

SALMON (E. S.) & WARE (W. M.). **Reports from the Mycological Department.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxvi, pp. 165–172, 1929.

During 1928 nearly every plant in 40 acres of King Edward potatoes grown from Irish and Forfarshire seed on a farm at Crayford was reported to be affected with a disease resembling leaf roll. It differed from true leaf roll, however, in that the lower foliage was unaffected, the seed tuber showed a soft rot, and at the edges of the field the plants were generally healthy. The disease was found to be due to the black dot fungus (*Colletotrichum atramentarium*) [*R.A.M.*, viii, p. 262].

The split-leaf disease of hops [ibid., viii, p. 627] has now been reported on other varieties than Fuggles. It seems to persist once it appears in a garden, but so far its only effect has been to weaken the growth of the bine.

A hitherto unrecorded disease of hops is referred to as 'small hop'. A normal number of small hops develops, but they are seedless and the petals remain diminutive. The disease was first reported in 1926 and another case occurred in 1927, when it was noticed that there were hundreds of densely crowded buds on the bases of the old bines, and in one place coming from the rootstock. A similar condition was found on a Fuggles seedling hop in 1928. Some of the bud masses were growing from the rootstock but in other cases the masses of buds were slightly raised on outgrowths, possibly galls, of the crown. One runner was girdled near the base by a mass of buds, which when sectioned was found to consist of a gall bearing the buds on the exterior. On the swollen bases of the cut bines as many as twelve buds were present on each side of the node. One half of the hill was dead. No fungus was found to which the disease could be attributed, but it is thought that the crown gall organism [*Bacterium tumefaciens*] or possibly one of the virus group of diseases may be concerned.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1928.** [Report on the activities of the Phytopathological Service in the year

1928.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 58, 99 pp., 6 pl., 4 diags., 2 graphs, 1929.

This report, prepared on similar lines to those of previous years [*R.A.M.*, viii, p. 547], contains numerous references of phytopathological interest, of which the following may be mentioned. The characteristic symptoms of the Hooghalen [soil acidity: ibid., vi, p. 578] disease were found in rye grown in acid soil. In addition to the 'tiger markings' the affected leaves showed large dead spots closely resembling those of the Veenkoloniale [grey speck] disease of oats [loc. cit.].

An unusual occurrence of potato scab [*Actinomyces scabies*] in acid soil is reported. Thorbecke and Paul Krüger potato plants from the Groningen Agricultural Experiment Station showed a yellow discoloration of the apical leaves, which were strewn with black dots and larger black spots. The cause of this condition, which is stated to be of regular occurrence in the Anna Paulowna polder [drained marsh], is still obscure. Very satisfactory results were given by the 'cautionary service', acting in collaboration with the Royal Dutch Meteorological Institute, in the issue of warning notices concerning impending outbreaks of potato blight (*Phytophthora*) [*infestans*: ibid., vii, p. 664]. Wart disease [*Synchytrium endobioticum*] occurred over an area of some 142 hect. About 25 immune varieties are now available for cultivation in the infested districts.

A rotting of the stem bases of peas, reported from various districts, was generally associated with the presence of a species of *Ascochyta*, while *Verticillium* and *Rhizoctonia* spp. were also occasionally found on the diseased plants.

Flax plants were attacked by a fungus (? *Fusicladium lini* or *Cladosporium herbarum*) causing yellow discoloration and arrested growth of the upper parts. The first-named organism is known to occur on seedlings in Belgium.

Evidence that tomato canker (*Didymella lycopersici*) [ibid., viii, p. 410] is a seed-borne disease is constantly increasing [ibid., v, p. 196]. Heavy damage (up to 50 per cent. of the fruits in certain frames) was caused round Leuven (Belgium) and in some Dutch nurseries by an entirely new bacterial disease of tomatoes, characterized by a damp, black rot of the blossom-end; the upper trusses were chiefly attacked. Another new tomato disease was marked by the presence of numerous black spots in the interior of the fruit. In a consignment received from England these spots were of a stony consistency.

Lettuce plants grown in cold soil at Dubbeldam were attacked, as in previous years, by a rust possibly identical with *Puccinia cichorii* [ibid., v, p. 275].

A species of *Verticillium* (possibly identical with *V. albo-atrum*) and also *D. lycopersici* were isolated from a completely withered strawberry plant [ibid., vii, p. 730]. Deutsch Evern strawberries proved extremely susceptible to mildew (*Sphaerotheca castagnei*) [*S. humuli*], against which early dusting with ventilato sulphur [ibid., viii, p. 701] is recommended.

Satisfactory control of *Gloeosporium* [*venetum*: ibid., vi, p. 739] and other fungous diseases of raspberries in Brabant has been

obtained by spraying with carbolineum (7·5 per cent.) in February or March, and with lime-sulphur (1 in 40) or 1 per cent. Bordeaux mixture immediately after the new growth is formed in April and again shortly before leaf fall at the end of September or beginning of October.

A species of *Ascochyta* was found on the buds and inflorescences of a lilac [*Syringa vulgaris*] bush which had not flowered for several years [cf. ibid., vi, p. 555].

Primula obconica was severely injured by *Thielavia basicola* and *Phoma* sp., which caused a yellow discoloration of the foliage and a brown decay of the roots. The virulence of *T. basicola* has been found to decrease at temperatures above 20° C. [ibid., vii, p. 279], and the removal of affected plants to frames kept at 20° to 30° resulted in a considerable improvement within a few weeks. Good results were also obtained by watering plants exposed to infection in pots with a 0·25 per cent. uspulun solution.

Much damage was inflicted on Douglas firs [*Pseudotsuga taxifolia*] in a mixed plantation by *Phomopsis pseudotsugae* [ibid., viii, p. 78].

Notes are given on the results of experiments in the control of various pests and diseases, and on the outcome of trials with some new disinfectant preparations.

Rivera (V.), Rivera-Campanile (Giulia), & Corneli (E.). **Rassegna dei casi fitopatologici osservati nel 1928 nel Laboratorio ed Osservatorio di Patologia Vegetale presso il R. Istituto Superiore Agrario di Perugia.** [Survey of phytopathological cases observed in 1928 at the Laboratory and Observatory of Plant Pathology associated with the Royal Higher Agricultural Institute of Perugia.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 2, pp. 131–163, 6 figs., 1929.

Notes are given on a large number of diseases of plants noted in the vicinity of Perugia during the period under review, arranged chronologically according to the date when each disease was first observed.

Smolák (J.). **Zpráva o činnosti Stanice pro Choroby Rostlin na Mělníce za školní rok 1928–29.** [Report on the activities of the Phytopathological Station in Mělnik for the academic year 1928–9.]—*Pátá Výroční Zpráva Státní Vyšší Ovocnicko-vinařske a Zahradnické Školy* [*a.t.d.*] *na Mělníce za školní rok 1928–29* [*Fifth Annual Report of the State High School of Pomology, Viticulture, and Horticulture* [*etc.*] *in Mělnik for the academic year 1928–9*], Mělnik, pp. 83–94, 6 figs., 1929.

In this report on the work done in 1928–9 at the Phytopathological Station in Mělnik [north Czecho-Slovakia] the author gives brief notes on the insect pests and physiological and fungal diseases which were observed in the region in that year on the chief agricultural crops. All the information of phytopathological interest contained in this paper has already been noticed in this *Review* from other sources.

[Noble (R. J.).] **Biologist.**—*Ann. Rept. Dept. of Agric. New South Wales for the year ended 30th June, 1928*, pp. 16, 1929.

This report contains the following items of phytopathological interest not already noticed. Good control of flag smut of wheat (*Urocystis tritici*) has been achieved in a number of cases by the use of resistant varieties, coupled with suitable rotation and improved cultural practices.

Virus diseases of potatoes recorded include leaf roll, mosaic, curly dwarf, spindle shoot, and spindle tuber.

Bacterium vesicatorium caused heavy damage to tomatoes in certain localities.

Eastham (J. W.). **Report of Provincial Plant Pathologist, Vancouver.**—*Twenty-third Ann. Rept. Dept. of Agric. British Columbia, for the year 1928*, pp. 36–40, 1929.

In addition to information already noticed from other sources, this report contains the following items of interest. Promising results in the control of the *Rhizoctonia* disease of potatoes [*Corticium solani*: *R.A.M.*, viii, p. 155] were given by Du Pont 76 bel (1 in 40), which was found to compare favourably with corrosive sublimate and with the other organic mercury compounds tested.

Hothouse tomatoes in the neighbourhood of Victoria have suffered severely for the last year or two from a form of foot rot involving the death of the fine feeding rootlets and of the growing tips of the larger branch roots. The first symptom of the disease is a slight drooping of the leaves in bright sunshine; growth is arrested and the fruit fails to mature. The latter may show external pitting, sometimes in the form of depressed spots and sometimes as red areas. The entire central placental region may be blackened. No organism has been detected, but good control has been obtained by steam sterilization of the soil, while formaldehyde also proved moderately effective. Considerable benefit was further derived from two applications to the soil of uspulun (1 in 400) at the rate of 5 quarts to 8 plants. Another tomato disease, known as breakdown or blister, was characterized by the development of semi-transparent, glassy, soft areas on the fruit, which collapsed at the slightest touch or even spontaneously. An important factor in the etiology of this disease is believed to have been the exceptionally scanty sunshine during October (less than two-thirds of the normal), while other possible contributory causes were excess of nitrogen in the soil and partial defoliation by mildew (*Cladosporium*) [*fulvum*].

The sweet cherry crop in the Kootenays was severely attacked by brown rot (*Sclerotinia* sp.), which is usually absent or inconspicuous in this region. In some cases 20 per cent. of the fruit was destroyed. The Bing and Lambert varieties seemed to be fairly resistant.

Deighton (F. C.). **Report on the Mycological Section.**—*Ann. Rept. Lands and Forests Dept. Sierra Leone for the year 1928*, pp. 14–19, 1929.

The following are amongst the records of plant diseases in Sierra Leone during 1928 [cf. *R.A.M.*, viii, p. 291]. Bananas suffered

from a disease of the stem associated with a species of *Marasmius*. The disease occurred in a low-lying area and was severe on the Guinea Negro variety.

A condition resembling pink disease (*Corticium salmonicolor*) was reported on cacao from various localities.

At Njala a leaf crinkle, possibly belonging to the virus group of diseases, affected Cape gooseberries [*Physalis peruviana*], growing near chillies which showed similar symptoms; the same virus was thought to be concerned in both cases.

Cassava mosaic [see above, p. 11] appears to be prevalent only in certain districts. It seems to spread very slowly and probably could easily be eliminated by roguing. Where the diseased plants are very numerous crop rotation, combined with the careful weeding out of all plants that grow up from the small pieces of root remaining in the ground, until the land is completely freed from the crop, when cassava may again be grown, should be effective. The record of mosaic on the allied Ceara rubber [*Manihot glaziovii*] made in the annual report for 1926 [loc. cit.] is now stated probably to have been made in error.

Scab [*Sporotrichum citri*] was common on lemon and sour orange [*Citrus bigaradia*] fruits and was very severe on the leaves of grapefruit at Njala.

An aphid (*Aphis laburni*) found frequently on rosetted groundnuts [ibid., vii, p. 15] and sometimes on healthy ones is thought to be probably the vector of the disease in Sierra Leone. There appears to be some evidence that the rapid spread of rosette is correlated with the appearance of the winged aphids.

In several localities groundnuts were affected by *Sclerotium rolfsii*. The same fungus also caused a leaf spot of Chinese yams [*Dioscorea* sp.] at Njala and Makung. The spots were circular, grey with a dark margin, concentrically zoned, and about 1 cm. in diameter, though larger on old leaves. White radiating hyphae were often visible on the spot and sclerotia were sometimes present. *S. rolfsii* was also noted on *Hippeastrum* sp., seedling avocado, *Caladium* sp., the pods of *Canavalia* bean [*C. ensiformis*: ibid., vii, p. 304], and banana suckers in transit.

A common disease of guinea corn (sorghum), especially in wet areas, was attributed to *Fusarium herbarum*; the inflorescence was mouldy, and affected grains were shrunken and often dark. *Physoderma zeae-maydis* was found on maize, but caused little damage. A rust (*Uredo cajani*) commonly affected the older leaves of pigeon pea at Njala. A grey spot at the edge of a turnip leaf was covered with the pycnidia of *Macrophomina phaseoli*.

Tomatoes are stated to be commonly affected by a serious wilt, the symptoms of which agree with those caused by *Bacterium solanacearum*.

White and wild yams [*Dioscorea* spp.] showed a witches' broom of the stems, of which only individual branches were usually affected, caused by *Bagnisiopsis dioscoreae*; the internodes were shortened, the stem was contorted, and the leaves near the affected parts were small and yellow. The fungus formed a thick stroma in the cortex, which it replaced, and eventually ruptured the epidermis;

the stems became covered with an irregular dark brown mass of fungus tissue, bearing perithecia and spores; occasionally, the leaf stalk and veins were attacked.

Brooks (A. J.). **Annual Report of the Department of Agriculture, Colony of the Gambia, for the year 1928–9,** 54 pp., 2 pl., 1 plan, 1929.

This report contains (pp. 11–12) the following reference of phytopathological interest. Three species of jassids thought to be involved in the transmission of rosette disease of groundnuts [*R.A.M.*, vii, p. 15, and preceding abstract] were identified by the Imperial Bureau of Entomology as *Cicadulina arachidis* China sp. n., *C. similis* China sp. n., and *Empoasca* sp. A high degree of resistance to rosette was again shown by the Basse, Philippine Pink, and Philippine White varieties.

Stell (F.). **Plant pathology.**—*Admin. Rept. Dept. Agric. Trinidad and Tobago for the year 1928*, pp. 49–51, 1929.

Notes are given on some of the more prevalent diseases of cacao in Trinidad, including witches' broom (*Marasmius perniciosus*), black pod (*Phytophthora*) [*palmivora*], and root diseases (*Rosellinia* spp. and *Sphaerostilbe* [*repens*]), most of the information on which has already been noticed from other sources [cf. *R.A.M.*, viii, pp. 356, 488].

Thread blight of coffee (*Pellicularia* [*Corticium*] *koleroga*) was very severe during 1928 on old, neglected bushes, mostly Arabica. Before resort is had to spraying, the fundamental requirements of the bushes as to space, shade, pruning, &c., must receive attention.

Ashby (S. F.). **Diseases of Limes and Sugar-Cane in the West Indies.**—*Kew Bull. Misc. Inform., 1929*, 7, pp. 209–214, 1929.

This is a report of the author's visit to the West Indies in January to March, 1929, which was undertaken primarily to investigate the so-called 'red root disease' of the Dominica lime plantations. *Sphaerostilbe repens* [*R.A.M.*, vii, p. 715], the conspicuous rhizomorphs of which suggested the common name of the disease, was prevalent in the cortex and on the roots of lime trees situated at varying altitudes and in different types of soil. However, neither this fungus, nor any of the others sometimes found on the dying trees, is considered to be the cause of the trouble, which is attributed primarily to storms and abnormally wet weather in 1926 and 1927. The writer agrees with Prof. Briton-Jones that the sole effective remedy for immediate and deferred losses due primarily to storms (of which there was another severe one in September, 1928) is the budding or grafting of limes on sour orange [*Citrus bigaradia*] stocks [ibid., vii, p. 716].

Gumming disease [*Bacterium vascularum*: ibid., viii, pp. 463–466] was detected on three old sugar-cane varieties on a lime estate

in Dominica. Two of the affected varieties were Purple Transparent and Caledonia Queen (Cavengerie). The Agricultural Department was advised to obtain good resistant seedling canes of recent origin, e. g., B.H. 10(12) and S.C. 12/4, for distribution. A visit to the sugar-cane plantations of Antigua showed that scarcely a single stool of the Ba. 11569 variety was free from gumming disease, which had also spread, in a slighter degree, to most of the adjacent varieties. The cultivation of Ba. 11569 is accordingly to be discontinued in Antigua.

Forty-first Annual Report of the Kentucky Agricultural Experiment Station for the year 1928, 50 pp., 1929. [Received November, 1929.]

In the section of this report dealing with tobacco diseases (pp. 13–17) it is stated that true mosaic infection may be spread at pulling time by men who smoke air- or fire-cured tobacco as well as by those who chew it [*R.A.M.*, viii, p. 270], as the fingers become contaminated while the dry tobacco is being handled. After using sterile tobacco while pulling, and removing the few mosaic plants found about one month after setting in a field of 15,000 plants, counts made of the second suckers showed only 0·7 per cent. mosaic; when no precautions were taken, infection in the same field after setting averaged 8 per cent.

It was also found that each of the 15 commercial brands of tinned smoking tobacco tested carried mosaic, but it was more difficult to contaminate the fingers by handling these than by handling the cured natural leaf. Of 15 brands of cigars examined, about one-half carried mosaic in a form readily transmissible to tobacco plants. Five out of 11 brands of plug chewing-tobacco, mixed with water and rubbed on plants after pulling and before setting, gave about 14, 4, 2, 2, and 12 per cent. mosaic; when natural leaf decoction was used, 41 out of 64 plants became infected.

Three strains of cucumber mosaic, 'puff', 'severe puff', and 'mild puff' [loc. cit.], are being investigated, each of which produces mosaic in cucumbers and tobacco, but with different degrees of intensity. The original strain of severe puff was found to be mixed with 'healthy potato' virus [ibid., vii, p. 767]; each was obtained pure by transferring the mixture to seedling potatoes, thus eliminating the cucumber mosaic, and to cucumbers, which eliminated the 'healthy potato' virus.

Tomato streak [ibid., vii, p. 659] was produced by a mixture of 'healthy potato' virus with puff, severe puff, etch, severe etch, and the various strains of true tobacco mosaic; it was also produced by a strain of tobacco mosaic (designated C. T.) when used alone. Dried tobacco containing the virus produced the disease when rubbed on healthy tomato plants, indicating that it is not a mixture of 'healthy potato' virus and tobacco mosaic [cf. ibid., vii, pp. 301, 605]. A comparison of tomato streak produced by a mixture of the potato virus with a mild strain of true tobacco mosaic and by one of the same virus with a severe strain of the mosaic showed that the latter mixture produced a much severer form of streak than did the former. Evidence is being accumulated which

indicates that tomato mosaic of a type severe enough to be easily recognized is commonly caused by one of the etch group of viruses.

Attempts to free a strain of Cobbler potatoes from the 'healthy potato' virus by sprouting them in complete darkness and rooting the tips of the sprouts in the greenhouse were unsuccessful, the virus being found in the tips of etiolated sprouts 16 in. long.

Tests of three hybrid strains of air-cured dark tobaccos resistant to root rot [*Thielavia basicola*], made in infected beds, in comparison with a susceptible variety, suggested that it may be possible to grow resistant plants in infected beds with little risk of injury.

Brown root rot [ibid., vii, p. 811] was very severe during 1928 on tobacco following maize. Isolations made throughout the summer from rotting rootlets yielded, fairly consistently, a *Pythium*-like organism. Previous studies showed that when dead maize roots, collected in winter from a plot sown continuously to maize, were mixed with sand in which tobacco was then planted, a disease resulted which was similar to brown root rot: the rotting tobacco rootlets contained *Pythium* spores of the same type as those found in the rotting maize roots. From this it is inferred that the *Pythium* causing root rot of maize in Kentucky [ibid., viii, p. 168] is also the cause of brown root rot of tobacco.

GARDNER (M. W.). **Indiana plant diseases, 1927.**—*Proc. Indiana Acad. Sci.*, xxxviii (*1928*), pp. 143–157, 4 figs., 1 graph, 1929.

This report, prepared on the lines of previous summaries [*R.A.M.*, viii, p. 157], contains numerous interesting items, of which the following may be mentioned. Two varieties not previously reported as susceptible in Indiana, viz., Golden Winesap and Hubbardston, were infected by apple blotch (*Phyllosticta solitaria*). Brown bark spot or measles [ibid., vii, p. 228] occurred in two counties on apples and in one on Flemish Beauty pears. Brown rot (*Sclerotinia fructicola*) [*S. americana*] was exceptionally virulent in peaches, and the die-back associated with *Valsa leucostoma* was found as a sequel to the old brown rot cankers.

Marked resistance to anthracnose of currants (*Pseudopeziza ribis*) was shown by the London Market variety.

Leaf spot of cherry (*Coccomyces hiemalis*) was more severe than at any time during the last nine years, causing heavy defoliation and noticeable loss of flavour in the fruit. Sweet cherry stocks and French Mahaleb seedlings were badly damaged, and in Lawrence County the young fruits were killed by pedicel lesions containing spores [cf. ibid., viii, p. 354].

Wheat scab (*Gibberella saubinetii*) was more serious than at any time since 1919, and heavy damage was also caused to wheat by *Colletotrichum cereale*.

Alternaria herculea [*A. brassicae*: ibid., iv, p. 61] occurred on Chinese cabbage [*Brassica pekinensis*] and turnip.

Onion smut (*Urocystis cepulae*) was detected for the first time in the important commercial bulb crop of Indiana.

Pod and stem blight of soy-beans (*Diaporthe sojae*) was very prevalent on the Manchu variety near Odell. The purple seed stain of soy-beans (*Cercosporina kikuchii*) [ibid., viii, p. 221] was found in 53 out of 54 seed samples from 17 counties. In October the disease was found in the field, indefinite darkened areas on the dying pods being associated with purple lesions on the underlying seeds. The fungus was cultured from the pod tissues. Much of the seed infection appears to emanate from the hilum.

MILBRATH (D. G.). **Plant pathology.**—(*Ninth Rept. California Dept. of Agric. for the period ending December 31, 1928*) *Monthly Bull. Dept. of Agric. California*, xvii, 12, pp. 683–687, 1928. [Received October, 1929.]

On receipt of a report that rose stock propagated in California was infected with a chlorotic, virus type of disease investigations were made over a wide area, but no evidence was obtained of the presence of any infectious virus disease of roses in the State. A few chlorotic rose plants were found in one greenhouse, but attempts to transmit the condition by means of the aphids *Myzus rosarum* and *Macrosiphum rosea* gave negative results.

In August, 1928, root rot (*Ozonium* [*Phymatotrichum*] *omnivorum*) was found in soil of date gardens at Indio. A survey showed that elsewhere in California the fungus was present only in the recent alluvial soils of the Colorado river in the Palo Verde (Blythe) and San Pasqual (Bard) valleys, where it may be indigenous or have been introduced in flood waters. It is surmised that the disease was brought to Indio on plants from infected areas.

Twenty-eighth Annual Report of the Bureau of Agriculture, Philippine Islands, for the fiscal year ending December 31, 1928.—156 pp., 39 pl., 1929.

The report contains (p. 70) the following item of phytopathological interest. Of the 5,101,672 coco-nut trees inspected during the year in 17 provinces, 13,252 were found to be infected with bud rot [*Phytophthora palmivora*] and 7,371 with the stem-bleeding disease [*Thielaviopsis paradoxa*: *R.A.M.*, viii, p. 25]. Nearly all the diseased trees were cut down and burnt.

Some notes are given on the work of the plant diseases section on pp. 75–6.

Twenty-seventh Annual Report of the Bureau of Science, Philippine Islands, for the year ending December 31, 1928, —73 pp., 1929.

The following item of phytopathological interest occurs in this report. A severe and widespread die-back disease which has rendered the cultivation of cacao unprofitable in many parts of the Philippines, and is characterized by the death of the terminal portions of the branches, a generally unhealthy appearance, and the virtual absence of fruits [*R.A.M.*, vii, p. 143], is stated to be caused by a species of *Colletotrichum*. It has been partially controlled by suitable cultural measures, combined with the excision of infected material and painting the stubs with asphaltum.

MATSUMOTO (T.). **On the diagnosis of certain plant infectious diseases by means of serological reactions.**—*Journ. Soc. Trop. Agric.*, i, 1, pp. 14–22, 1929. [Japanese, with English summary.]

In order to determine the possibility of applying serological methods to the diagnosis of certain plant diseases [cf. *R.A.M.*, viii, pp. 420, 705], the author made intraperitoneal injections into rabbits with *Bacillus* sp. (No. 216), isolated from soft rot of various Brassicas and from radish in Japan, *B. carotovorus* cultures from Jones's soft rot of carrots received from the United States, and *Bacterium* sp. (No. 217), a relatively weak parasite isolated from the same hosts as No. 216. The animals were bled from the marginal ear vein on the 9th day after the last inoculation. The following expressed juices were used as antigens. (1) Diseased plant tissues of *Brassica pe-tsai* [*B. pekinensis*], radish, turnip, and carrot inoculated with one of the following: the three above-mentioned organisms, *Bacillus aroideae* received from U.S.A., and *Sclerotinia libertiana* [*S. sclerotiorum*], ground in a mortar (after a week's incubation), mixed with twice as much saline solution as the volume of the crushed tissues, and filtered through paper. These solutions were still turbid owing to the suspension of the pathogens and particles of crushed tissues. (2) The expressed juices of the diseased tissues (after a fortnight's incubation) prepared as above, but mixed only with an equal amount of saline solution or left undiluted, and then passed through a Berkefeld N filter. These solutions were clear and free from bacteria.

When antisera were added separately to each of the above-named filtrates, positive results, viz., agglutination in the suspensions and precipitation in the clear solutions, occurred only in the homologous antigens, indicating that the tests are specific for each organism and applicable to the diagnosis of the diseases in question. In the clear solutions the reactions were observed up to 1 in 40 serum dilution, while in the suspensions they extended to 1 in 160.

RAMCHANDANI (J. C.). **Saltations in bacteria. II. Bacillus prodigiosus.**—*Ann. of Botany*, xliii, 171, pp. 579–586, 1 pl., 1929.

In this paper the author gives some details of the conditions under which saltation occurred in a strain of *Bacillus prodigiosus* obtained from the collection of type cultures of the Lister Institute, London, and which resulted in the formation of a pure white sector in a colony of the normal red colour [cf. *R.A.M.*, vii, p. 621]. Subcultures from the white sector consistently retained their white colour, but eventually again showed saltation to yield a second white but more transparent strain. All attempts to induce reversion to the parent type, either by the action of various chemical substances or by passage through a mouse, gave negative results. Both white strains were shown to have retained unchanged the morphological, physiological, and serological characteristics of the original red strain, with the exception that the second white saltant had lost its pathogenicity for the mouse.

Evidence was also obtained that the secondary red colonies which appear on old primary colonies decolorized by high incuba-

tion temperature are normally produced, on transference to lower temperatures, by isolated cells that have retained their power of germination.

LEVINE (M. N.). **A comparison of the behaviour of crown gall and cancer transplants.**—*Bull. Torrey Bot. Club*, lvi, 6, pp. 299-314, 2 pl., 1929.

After a brief reference to Jensen's account of his successful transplantation of crown gall tissue, either of spontaneous origin or artificially produced, from one species of beet to another (*Medd. Kgl. Veter. og Landbohøjskoles Serumlab.*, liv, pp. 91–143, 1918), the author describes similar transplanting experiments which he conducted during three consecutive years. These consisted in producing crown gall tumours by inoculation with *Bacterium tumefaciens* on castor bean (*Ricinus communis*), the common garden beet, the Yellow Tankard mangel, and the tomato, and in transplanting small pieces of the crown galls to healthy portions of the same plant (autotransplants), to healthy individuals of the same species (homeotransplants), or to plants of different genera (heterotransplants), among which were included rose, tobacco, *Ficus elastica*, and geranium.

The results showed that all three types of transplants succeeded, in a certain proportion of cases, in producing crown galls on the host, when the latter is one that is capable of responding to inoculations with *Bact. tumefaciens*. In the great majority of cases, however, the inoculum failed to establish itself on the host, and either disappeared totally or was reduced to a small shrivelled and blackened body surrounded by the proliferating host tissues. A few transplants from red garden beet to Yellow Tankard mangel developed into galls of appreciable size, but histological examination of the galls indicated that the host tissue had also been stimulated and had taken part in the formation of the tumour. These transplants differed from animal cancer transplants in that they did not form the sole substance of the new tumour tissue, while the fibro-vascular elements found in them were the result of a differentiation of the parenchymatous tissue of the gall.

It is stated that isolations from the crown gall tissue, from which the inocula were taken, always produced an abundance of *Bact. tumefaciens* in plated cultures.

RIVERA (V.). **Influenza del trattamento di tubi di emanazione sopra lo sviluppo di alcuni microrganismi vegetali.** [The effect of emanation tubes on the development of certain plant micro-organisms.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 2, pp. 241–247, 2 figs., 1929.

Continuing his investigations into the effects of radium emanation upon bacteria [cf. *R.A.M.*, viii, p. 93], the author conducted experiments in which a capillary tube containing radium was placed in test tubes in which were cultures of *Bacterium tumefaciens*, *Bact. fluorescens*, and *Penicillium crustaceum*.

In each case germination was inhibited in that part of the culture directly exposed to the emanations, to a depth varying

from 15 mm. with a dosage of 12 millicuries to 2 mm. with one of 1·3 millicuries.

It is concluded that the gamma rays inhibited the growth of the organisms, which were then killed by the beta rays.

LAMBERT (E. B.) & STAKMAN (E. C.). **Sulphur dusting for the prevention of stem rust of Wheat.**—*Phytopath.*, xix, 7, pp. 631–643, 1 fig., 1929.

Effective control of stem rust of Marquis wheat (*Puccinia graminis*) was obtained at various localities in Minnesota during 1925 and 1926 by the application of sulphur dusts [*R.A.M.*, v, p. 409]. Of the five different commercial brands used, kolodust [ibid., vii, p. 565] gave the best results, followed by 'sulphur smoke'. The best rate of application of the dusts has not yet been determined. The disease was controlled by applications of 150 lb. per acre, and there is some evidence that 50 lb. or less may suffice. In 1926 dusting appears to have increased the yield at Crookston, Minnesota, by about 30 per cent. Even this gain, however, would not cover the cost of three applications at the rate of 50 lb. per acre.

Under Minnesota and North Dakota conditions the results indicated that it may not be necessary to begin dusting until the wheat is in flower. Five-day intervals between each application appear to be the most satisfactory, though there are indications that effective control may be given by dusting every ten days. It is doubtful, however, whether the sulphur dusts would adhere to the wheat for this length of time in all kinds of weather. Three or more applications are generally necessary to insure adequate control, but under certain conditions one or two may delay the appearance of the rust and considerably reduce its incidence.

RUDORF (W.). **Zur Frage der Verwendung der Sortenimmunität gegen pilzliche Parasiten als Unterscheidungsmerkmal für das Getreidesortenregister.** [On the question of the use of varietal immunity from fungous parasites as a differential character for the cereal variety register.]—*Planzenbau*, vi, 1, pp. 25–26, 1929.

In this further contribution to the discussion on the value of varietal immunity from fungous parasites as a differential character in distinguishing varieties of the host, the writer briefly recapitulates his arguments, in opposition to Scheibe's opinion [*R.A.M.*, viii, p. 556], for the inclusion of biotypical resistance (resistance against particular physiological races of the parasites) as a distinguishing mark for the forthcoming German cereal variety register.

RIEHM (E.). **Erprobte Beizmittel und Beizverfahren.** [Tested disinfectants and disinfection processes.]—*Mitt. Deutsch. Landw. Gesellsch.*, xliv, 34. pp. 748–749, 1929.

Discussing the various standard methods of seed-grain disinfection approved by the German Plant Protection Service, the writer draws attention to the merits of the short disinfection process [*R.A.M.*, viii, pp. 640, 768]. Among the foremost of these is

economy, the cost of treating 1 cwt. of barley seed-grain with germisan being only M. 0·80 compared with M. 1·12 for dusting with tillantin or ceresan, while for rye the corresponding figures are M. 0·48 for the germisan short disinfection process, as against M. 0·56, 0·84, and 0·56, respectively, for abavit B, tillantin or tillantin R, and ceresan dusts. Its use at present, however, should be restricted, in wheat, to seed-grain which has been completely freed from bunt [*Tilletia caries* and *T. foetens*] balls by up-to-date cleansing apparatus.

Two hours' immersion in water at 45° C. is recommended against loose smut of wheat (*Ustilago tritici*) and barley (*U. nuda*), a 0·125 per cent. solution of a mercury compound at the same temperature being substituted where stripe disease of barley (*Helminthosporium gramineum*) is also present, while combined loose smut and bunt of wheat are best treated by four hours' soaking in a 0·125 per cent. mercury solution at 25° to 30°.

Good results have been given in the official German tests by the dusting apparatus of A. Fock, Stargard (Pomerania), as well as by the continuous apparatus of F. H. Schule, G.m.b.H., Hamburg 35, Hammerdeich 70–91.

Fromme (F. D.). **The control of cereal smuts by seed treatment.**—*Virginia Agric. Exper. Stat. Bull.* 262, 16 pp., 4 figs., 1928. [Received October, 1929.]

Details are given of recent experiments at the Virginia Agricultural Experiment Station in the control of cereal smuts by seed treatment with a number of well-known fungicides, including various proprietary preparations. Amongst the newer substances tested, satisfactory control of wheat bunt (*Tilletia leris*) [*T. foetens*] was given by 15 minutes' immersion in 0·25 per cent. super-kalimat (Chicago Process Co.) and by dusting sulphur.

Dillon Weston (W. A. R.). **The effect of Tilletia caries (DC.) Tul. (T. tritici (Bjerk.) Wint.) on the development of the Wheat ear.**—*Phytopath.*, xix, 7, pp. 681–685, 5 figs., 1929.

During his six years' investigations at Cambridge on the reaction of wheat varieties to bunt (*Tilletia caries*) [*R.A.M.*, viii, p. 436], the writer made observations on the morphological changes occurring in the ears of infected plants. In the American Club variety (*Triticum compactum*) some of the spikelets on the bunted ears are awnless, while the whole ear is elongated so that it closely resembles a clean *vulgare* variety. In Velvet Don (*T. durum*) and Turkey (*T. vulgare*) the awns are also absent from diseased ears. In one case three ears of bunted Velvet Don were harvested two or three weeks before maturity, while another three (also infected) were cut when ripe. Awns were present on the former but not on the latter, indicating that they broke off when the culms swayed from side to side, and that their apparent 'suppression' is merely due to weakness and is devoid of genetical significance. In the case of the Marshal Foch variety (*T. vulgare*), where the normal awns are only slightly developed, the awns of bunted ears are not suppressed.

Doughty (L. R.), Engledow (F. L.), & Sansom (T. K.). **Investigations on yield in cereals. VI. A. A development study of the influence of nitrogenous top-dressing on Wheat. B. A measurement of the influence of disease ('take-all') upon the yield of Wheat.**—*Journ. Agric. Sci.*, xix, 3, pp. 472–490, 1 plan, 1 chart, 1929.

A detailed account is given of the authors' investigations into the effects of nitrogenous top-dressing upon wheat yields. An analytical method, referred to as a 'census of an acre', was adopted, periodic observations being made upon small samples distributed over a representative acre in a field crop. The field was divided into 8 strips (each alternate strip receiving a top-dressing of sulphate of ammonia applied at the rate of 1·5 cwt. per acre on 28th February, 1928) across the drills, each 6·75 ft. wide, and 75 samples, each consisting of all the plants in 1 foot length of drill, were marked out at fixed intervals in every strip. Shortly after the emergence of the ears, the field showed obvious infection with whiteheads (*Ophiobolus cariceti* [*O. graminis*] and other fungi), and the total ears from each sample were classified as healthy and diseased, the latter being readily distinguishable as the grain was completely shrivelled and the chaff discoloured by a secondary attack of *Cladosporium herbarum*. The census of an acre method permitted of accurate measurement of the amount of loss from disease.

It was found that the disease caused a 30 per cent. loss of plants by death in the latter half of the crop life. In the surviving plants the loss by ear damage was heavy, the percentage of ears affected being 24·6 in the top-dressed strips and 32·5 in the undressed, while the average yield of grain per ear was reduced from 1·21 gm. in healthy ears in the top-dressed to 0·39 gm. in diseased ears, the corresponding figures in the undressed strips being 0·98 and 0·27, respectively.

Henry (A. W.) & Foster (W. R.). **Leptosphaeria foot rot of Wheat in Alberta.**—*Phytopath.*, xix, 7, pp. 689–690, 1929.

In addition to *Helminthosporium sativum*, *Ophiobolus graminis*, and *Fusarium* spp. [*R.A.M.*, viii, p. 359] a species of *Leptosphaeria* has been isolated from wheat plants affected by root rot in Alberta. Perithecia of the fungus have been found in abundance on old wheat stubble, and a similar form was collected on wild grasses. The ascospores of the foot rot *Leptosphaeria* measure 25 to 40 μ (average $33 \pm 2\ \mu$) by 4 to 6 μ and are 6- to 8-septate; they closely resemble those of *L. herpotrichoides* [ibid., viii, p. 437], from which the perithecia differed only in the less raised ostioles and the absence of hairs. In the latter respect the Alberta fungus is more like *L. culmifraga* [ibid., iv, p. 275]. According to Mangin (*Bull. Soc. Myc. France*, xv, p. 210, 1899), the perithecial characters of *L. herpotrichoides* vary widely in different collections, being probably influenced by environmental characters. The Alberta fungus further corresponds with *L. herpotrichoides* in the production of typical appressoria, which developed in profusion on Marquis wheat artificially inoculated with a monosporous culture.

The fungus attacked the plants at a relatively late stage, like *O. graminis*. Definite symptoms of foot rot were produced in laboratory and greenhouse tests. The optimum temperature for vegetative growth appears to lie between 20° and 25° C., thus agreeing more closely with *O. graminis* than with the other above-mentioned foot-rotting fungi.

Tasugi (H.). **On the snow rot (yukigusare) fungus, Typhula graminum, Karsten, of Graminaceous plants.**—*Journ. Imper. Agric. Extens. Stat.*, i, pp. 41–56, 2 pl., 1929. [Japanese, with English summary. Abs. in *Japanese Journ. of Botany*, iv, 4, p. (105), 1929.]

The snow rot fungus ('yukigusare') attacks winter wheat, barley, &c., under the snow cover in Japan, producing sclerotia in the infected organs. Affected plants may be completely destroyed or the young tillers may survive. In the spring the fungus becomes inactive and the sclerotia lie dormant in the field. In the late autumn they produce fruit bodies bearing numerous basidiospores. Under cold, dark conditions the fruit bodies arising from the sclerotia resemble those of *Typhula graminum* [*R.A.M.*, vii, p. 28], while in sand or soil they approximate to those of *T. elegantula* Karsten. These two forms are therefore considered to be identical, the Japanese fungus being named *T. graminum*.

Porter (R. H.), Yu (T. F.), & Chen (H. K.). **The response of hulless Barley to seed treatment for covered smut and stripe disease.**—*Phytopath.*, xix, 7, pp. 657–666, 1929.

Further experiments have been conducted at Nanking, China, on the control of covered smut and stripe disease of barley (*Ustilago hordei* and *Helminthosporium gramineum*) [*R.A.M.*, vii, p. 438].

The best control of *U. hordei* in hull-less barley was given by copper carbonate and uspulun [tillantin R] dusts, applied at the rate of 2 oz. per bushel, the incidence of infection being reduced to less than 0·5 per cent. An average of two tests with stripe-infected seed-grain gave 12·8 per cent. infection on the untreated plots and 2·1 per cent. on those treated with tillantin R. In one test copper carbonate reduced the percentage of infection by *H. gramineum* from 10·8 to 5·5 per cent. This dust was less efficacious than the liquid treatments in the control of stripe (which was completely eliminated by one to two hours' immersion in 0·3 per cent. uspulun), but it caused a heavy increase of yield, as also did tillantin dust. Special attention is drawn to this increase in yield of hull-less barley after some of the dust treatments independently of their control of these diseases.

In conclusion the desirability of the regular seed treatment, either with tillantin R or copper carbonate, of hull-less barley in the lower Yangtse valley is emphasized.

Foëx (E.) & Rosella (E.). **Sur deux helminthosporioses de l'Orge.** [Notes on two helminthosporioses of Barley.]—*Ann. des Épiphyties*, xiv, 4, pp. 269–279, 4 pl., 6 figs., 1929.

Helminthosporium sativum [*R.A.M.*, viii, p. 438] was observed

by the authors in the spring of 1928 causing a characteristic foot rot of barley, the symptoms of which are briefly described, in two localities of Morocco. The results of inoculation experiments [details of which are given] showed that the fungus is able to cause a damping-off of barley seedlings. In plants that survived, a yellow discoloration soon developed in the roots and brown spots appeared on the leaf sheaths, from which the mycelium passed into the stems and killed them. On the surface of the sheaths the mycelium formed a network, at first rather loose but gradually becoming denser, without, however, ever forming mycelial sheets. The ends of the hyphae were occasionally digitate. Piriform processes were fairly frequently observed on the sides of the hyphae; these formations are believed to function as appressoria, since the cell walls underlying them often presented a marked thickening, corresponding to the point of entry of a mycelial branch. In some cases, however, the hyphae penetrated a cell, presumably killed in advance, without causing a thickening of its wall. On barley leaves sprayed with a suspension of *H. sativum* spores, elongated brown spots developed in about 36 hours after inoculation; the spots were surrounded by a ring of lighter colour, particularly noticeable towards the apex of the leaves. The spores formed on the sheaths of inoculated plants were indistinguishable from those observed in nature.

A few notes are also given on another species of *Helminthosporium*, which was found to occur on barley practically throughout Morocco. The leaves of diseased plants bear either long-oval (5 by 1 mm.) or linear (7 to 10 by 1 to 2 mm.) brown spots. The conidiophores, usually either isolated or in pairs, measure 9 to 10 μ in breadth. The conidia are yellowish-brown, 3- to 4-septate, rarely constricted at the septa, and 75 to 85 by 16 to 20 μ in diameter. The authors consider that this species, in spite of some differences in the character of the spots caused by it and in the grouping of the conidiophores, should be referred to *H. gramineum*, the cause of the well-known stripe disease.

KUCHLER (L. F.). **Über die Ursachen der Erkrankungen und Bekömmlichkeitsverluste bei der Verfütterung ausländischer Futterstoffe.** [On the causes of illness and unwholesomeness in feeding with foreign fodders.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, vii, 6, pp. 137–143; 7, pp. 171–174, 1929.

In connexion with an account of the recent poisoning of stock in Germany by the consumption of American barley, which has been attributed to infection by *Gibberella saubinetii* [*R.A.M.*, viii, p. 650], the author cites a case in which a consignment of American maize, valued at M. 3,500, was found, on inspection by the Bavarian fodder control authorities, to be contaminated by *Penicillium* and bacteria to such an extent that 79 per cent. of the kernels were mouldy or rotten. In another case the imported maize was so badly contaminated that it was quite unfit for consumption even after treatment in the distillery. Compensation was refused on account of various legal technicalities. It is suggested that

extreme care be exercised in the importation of foreign fodders, which should, as far as possible, be replaced by home-grown material.

BELLER (K.) & WEDEMANN (W.). **Untersuchung über die Schadwirkung amerikanischer Futtergerste (sog. Barley Federal Nr. II).** [Investigation on the harmful action of American fodder Barley (so-called Barley Federal No. II).]—*Zeitschr. für Infektionskrankh., parasitäre Krankh. und Hygiene der Haustiere,* xxxvi, 1–2, pp. 103–129, 1929.

A full account is given of the writers' investigations, conducted under the auspices of the veterinary department of the State Board of Health at Berlin-Dahlem, on the nature and cause of the harmful action on swine of American fodder barley [see preceding abstract].

The Federal No. II barley, which was found to be heavily infected by bacteria and *Gibberella saubinetii*, was extremely unpalatable to the animals; the consumption of this fodder, in comparison with home-grown material, was in the ratio of 70 : 100 at the highest. The nature of the substance inducing the distaste could not be exactly determined, but the noxious principle is believed to reside in certain organic compounds which are not susceptible of chemical analysis. They have their seat in the glumes and bran layers of the grain, and may be rendered innocuous either by shelling or by aqueous extraction with one hour's heating followed by washing or neutralization with soda. Both these measures, however, add considerably to the cost of the fodder, and for practical purposes a mixture of the American barley with other grain in the proportion of 1 : 2 is recommended. Swine appear to be the only animals affected by the consumption of the infected fodder, and even with them the indisposition is purely temporary. There is considered to be some danger that *G. saubinetii* may be spread through the use of manure from swine fed with the diseased material.

MCDONALD (J.). **Notes on diseases of Coffee in Kenya.**—*Kenya Dept. of Agric. Bull.* 7 H, 3 pp., 1929.

The most important disease of coffee in Kenya is the coffee berry disease caused by a strain (apparently unknown elsewhere) of *Colletotrichum coffeanum* which attacks the green berries and quickly renders them unmarketable [*R.A.M.*, vi, p. 92]. Another strain of the fungus is a very common cause of a minor leaf spot and a brown blight of the pulp of ripe and ripening berries; it does not destroy the beans, but it may reduce their value. This strain is universally present as a saprophyte on dead coffee wood. The fruiting stage of the green berry strain on the host is indistinguishable from that of the brown blight strain, but in culture on certain media considerable differences appear. The berry disease is present in all districts where a comparatively high rainfall is distributed throughout most of the year, but it is unknown in those areas where two definite rainy seasons alternate with prolonged periods of drought.

Pink disease caused by *Corticium salmonicolor* is associated with abundant moisture and lack of ventilation. It is serious only in one district, where owing to frequent hailstorms there has been a tendency towards excessive shading. In many plantations in this area the passage of a through draught of air is impeded by thick belts of forest, while a heavy rainfall, amounting to 100 in. in some years, also favours the fungus.

C. salmonicolor has also been recorded in Kenya on loquat, guava, and *Cupressus macrocarpa*, and is said to attack *Sesbania*, a small tree used as coffee shade.

In preparing the land for coffee planting most Kenya growers have removed the stumps of the original forest, which has greatly reduced subsequent loss from root diseases. Where these occurred the dead bushes were promptly taken away, with the result that two of the commonest root diseases are known only by their symptoms, the fructifications of the fungus concerned not having been recorded. It is believed, however, that the commonest type, characterized by a radial splitting of the collar and tap root, is caused by *Armillaria mellea*. A second, much less prevalent, disease, in which the roots are encrusted in soil, is attributed to *Fomes lamaoensis*. Other cases were noted in which the roots were dry and brittle and sometimes contained the sclerotia of *Rhizoctonia bataticola* [*Macrophomina phaseoli*]. A very few instances were also seen of mealy bug root disease; in this a species of mealy bug lives under a thick covering of mycelium [of *Polyporus coffeae*: ibid., vii, p. 702] on the roots of young coffee plants. In Uganda the view is stated to be held that the mealy bug and its fungal covering are secondary to attack by *M. phaseoli*.

Notes are given on leaf disease (*Hemileia vastatrix*) and die-back, other, relatively unimportant, Kenya coffee diseases being listed.

STANER [P.]. **Rapport mycologique sur la campagne cotonnière de 1927 au Maniema et au Kivu.** [Mycological report on the Cotton campaign of 1927 at Manyema and Kivu.]—*Bull. Agric. Congo Belge*, xix, 4, pp. 528–536. 1928. [Received October, 1929.]

Notes are given on diseases of cotton observed during 1927 at Manyema and Kivu, Belgian Congo. Damping-off of young plants (*Rhizoctonia bataticola*) [*Macrophomina phaseoli*], reported at Sankuru in 1925, was present in the period under review in two localities in Manyema. Mosaic-like patches on the leaves were produced by *Cercosporella gossypii*, *Bacterium malvacearum*, *Cercospora gossypina*, *Macrosporium nigricantium*, and *Helminthosporium gossypii*. Boll rot and black arm caused by *Bact. malvacearum* were very prevalent and dangerous in the vicinity of Nyangme and south-east Manyema. Anthracnose due to *Colletotrichum gossypii* was also present, and the perithecia of the perfect stage of this fungus, *Glomerella gossypii*, were once observed on dead bolls.

GHESQUIÈRE (J.). **Principales maladies du Coton au Kasai et au Sankuru.** [The principal diseases of Cotton at Kasai and Sankuru.]—*Bull. Agric. Congo Belge*, xix, 4, pp. 552–561, 6 figs., 1928. [Received October, 1929.]

A few notes are given on sore shin of cotton in the Belgian Congo (attributed with some doubt to *Corticium vagum* [*C. solani*]), bacterial disease [*Bacterium malvacearum*: see preceding abstract], and canker of the collar attributed to *Neocosmospora vasinfecta*.

MAHDIHASSAN (S.). **Specific symbiotes of a few Indian scale-insects.**—*Centralbl. für Bakt.*, Ab. 2, lxxviii, 8–15, pp. 254–259, 7 figs., 1929.

The writer summarizes the observations made by himself and other workers in connexion with the specific symbionts of some common Indian scale-insects [*R.A.M.*, viii, p. 777]. In *Saissetia nigrum*, occurring on *Hibiscus rosa-sinensis* and many other hosts, the symbiont has filamentous as well as yeast-like forms. In *Coccus acutissimum*, found in Bangalore on *Michelia champaca* and mango; *C. viridis* on coffee, guava, and lemon; *Lecanium imbricans* on *Ficus mysorensis* and *Breynia rhamnoides*; *Pulvinaria* sp. on *Lantana camara*; *P. maxima* on *Zizyphus jujuba*; and *Ceronema koebeli* on *Pongamia glabra* the organisms resemble the apiculate yeasts, but the *Lantana* scale symbiont is regarded as an *Oospora*. Each symbiont is specific to its own insect. The smallest insect may be furnished with the largest symbiont, e.g., that of *C. acutissimum*.

MCCLELLAND (T. B.) & TUCKER (C. M.). **Green scale, Coccus viridis, a new pest in Coffee and Citrus.**—*Agric. Notes, Porto Rico Agric. Exper. Stat., Mayaguez*, 48, 2 pp., 1929.

The green scale (*Coccus viridis*) has recently become prevalent on coffee in Porto Rico, where it also occurs on citrus and guava. In Porto Rico two parasitic fungi have already been observed on it, one of which has been identified as *Cephalosporium lecanii* [*R.A.M.*, vi, p. 419]. In order to control the pest, it is recommended that water containing spores dislodged from dead scales covered with the fungus should be applied in damp weather, by means of a small hand-sprayer, to the upper branches of infested trees. Where a sprayer is not obtainable, leaves bearing diseased scales may be tied among the top branches of the trees.

PAILLOT (A.). **Sur l'origine infectieuse des microorganismes des Aphides.** [Infectious origin of the micro-organisms present in Aphids.]—*Comptes rendus Acad. des Sciences*, clxxxix, 4, pp. 210–213, 2 figs., 1929.

The author states that, as revealed by Giemsa smears, females of two species of aphids (*Aphis mali* and an undetermined species on strawberry) show the presence in their blood and mycetocytes of numerous slender rods, 1 to 1·5 μ long, which also occur in the eggs laid by them, although in smaller numbers. Besides these rods and the usual rounded cells [*R.A.M.*, viii, p. 570], transitional

forms were also observed in the shape of bacilli presenting a swelling in the middle or at one pole. The rods and transition forms were also seen in just hatched larvae of *A. mali*, but not in older ones; the larvae of the other species, and the parthogenetic generations of both species, were never found to contain them, but only the usual rounded, yeast-like symbiotic form.

WALKER (N.). **Fifty years of dermatology.**—*The Lancet*, ccxvii, 5527, pp. 209–214, 1929.

In the course of this lecture on various aspects of dermatology, the author describes the progress made of recent years in the treatment of ringworm and favus in Edinburgh. In 1912 a special school was established by the educational authorities for children affected by these complaints. During the 1920–1 session 290 pupils were discharged cured, and after 1924 the numbers decreased rapidly, until at present only 20 children are attending the school. Attention is drawn to the increasing prevalence in Great Britain of epidermophytosis or 'dhobi itch' [*Epidermophyton inguinale*] of the hands and feet [cf. *R.A.M.*, vii, p. 170; viii, p. 309], which should, in the author's opinion, be combated by similar means to those applied in the case of ringworm.

REWBRIDGE (A. G.), DODGE (C. W.), & AYRES (T. T.). **A case of meningitis due to Endomyces capsulatus (new species).**—*Amer. Journ. of Pathol.*, v, 4, pp. 349–364, 3 pl., 1929.

A detailed account is given of a fatal case of mycotic meningitis observed in 1928 in Boston, Massachusetts. The clinical symptoms were a hard, tender cyst on the patient's thigh, another similar cyst on his neck, violent headaches accompanied by loss of memory, and bilateral pulmonary tuberculosis. Death of the patient ensued at the end of two months from admission into hospital. Post-mortem examination of the organs revealed the presence, in the tissues of the thigh and neck cysts and on the pial surface of the medulla and surrounding the cranial nerves, of roughly concentric and conglomerate lesions composed of endothelial leucocytes and one or more foreign body giant cells. The cytoplasm of these cells and of the endothelial leucocytes contained round yeast-like organisms, surrounded by a clear, non-staining capsule, and varying from 0·7 to 2·8 μ in diameter (average 1·6 μ). Within the tissues this organism was observed to reproduce by budding, and no mycelial elements were observed. Isolations from the pus aspirated from the cysts and from a nodule from the pial surface of the medulla produced colonies of a species of *Endomyces*, which is considered to be new to science, and is named *E. capsulatus*. On acid media the organism formed a mycelium consisting of coarse, thin-walled, often somewhat contorted hyphae, 3·5 to 4 μ wide, and composed of nearly isodiametric cells. On neutral media with protein the hyphae are slender, branched, 1·4 to 1·5 μ in diameter, with long, mostly uninucleate cells. Budding cells about 3·5 by 5 μ are abundant on acid media, but absent on neutral media. Chlamydospores, terminal on short branches or in chains, develop from a mycelium resembling the racquet mycelium of

Trichophyton and related genera. The cells of this mycelium are 6·5 to 7 μ in diameter at the swollen end and 2·6 to 3 μ at the other. Sessile, piriform conidia, 5·5 by 6·5 μ in diameter, develop irregularly along the mycelium (usually near a septum) and are most abundant on media with protein nitrogen and a neutral reaction. Endospores formed by the rounding up of the protoplast into deeply staining, ellipsoidal masses, 2·6 by 3·2 μ, occur in the hyphae on Sabouraud's dextrose agar. Sexual reproduction, when present, is heterogamous. A cell of a hypha swells up to a diameter of about 11 μ and fuses with a smaller cell of a neighbouring hypha. The resulting asci are terminal on long stalks, subspherical, about 7 by 9 μ, and with eight hyaline, spherical, smooth ascospores, 2 μ in diameter. The cultural characters of the fungus on various media are given.

Inoculation experiments showed that *E. capsulatus* is pathogenic to mice, but not to rabbits or guinea-pigs.

GALLOWAY (D.). **The otomycosis of the Malay Archipelago commonly called 'Singapore ear'.**—*Malayan Med. Journ.*, iv, 1, pp. 3–6, 1929. [Abs. in *Trop. Dis. Bull.*, xxvi, 9, p. 759, 1929.]

Otomycosis is stated to be very prevalent, especially among Europeans, in the Malay Archipelago, occurring in about 70 per cent. of all ear diseases. The causal organism present is usually an *Aspergillus—A. flavus, A. niger*, or *A. fumigatus* [*R.A.M.*, vii, p. 720], but about 30 years ago *Mucor* was the commonest fungus found. The symptoms include deep-seated and persistent pruritus, varying degrees of deafness, and a sensation of moisture in the meatus, which also extrudes scaly, membraneous, or soapy material. True inflammation supervenes in cases of trauma of the meatus. Treatment consists in the application of dilute or concentrated antiseptics according as trauma is present or not, e. g., mercuric chloride, silver nitrate, and boric acid, followed by syringing out the fungus.

LANGERON (M.). **Les Asterinées parasites de l'homme. La piedra.** [Asterineae parasitic on man. Piedra.]—*Ann. de Parasitol. Humaine et Comp.*, vii, 4, pp. 309–324, 18 figs., 1929.

After a brief preliminary description of the Asterineae, a group of fungi which hitherto has not included human parasites, the author discusses in some detail the morphological and biological points of analogy that exist between these fungi and those of the Brazilian and Paraguayan piedra [*R.A.M.*, viii, p. 241], and probably also of the Colombian form of the disease. The causal fungus of piedra in Brazil was named *Trichosporum hortai* by Brumpt in 1913. The piedra nodules consist of an ascostroma, closely resembling that in the Asterineae, with a fringe of mycelial filaments, and Horta's cysts are in reality asci filled with scolecospore-like ascospores. The asci appear to be scattered in the mass of the stroma, which thus presents a structure analogous to that described by Arnaud in the Protothyrieae. The author accepts the new generic

name *Piedraia* proposed by Da Fonseca and Leão [loc. cit.], as these fungi are quite distinct from those of the type of *T. beigeli* [ibid., v, p. 363].

Szathmáry (S.). **Über eine durch den Kaufmann-Wolfschen Pilz verursachte Epidermophytosis.** [On an epidermophytosis caused by the Kaufmann-Wolf fungus.]—*Dermatol. Wochenschr.*, lxxxix, 44, pp. 1769–1776, 1929.

Kaufmann-Wolf's *Epidermophyton* was isolated from the primary lesions on the right foot of a Hungarian woman suffering from dysidrosis [*R.A.M.*, vii, pp. 635, 636]. No trace of the fungus could be found in the secondary urticarious eruptions developing on the left foot and on the hands. A marked tendency to pleomorphism was exhibited by the *Epidermophyton* on maltose and maltose peptone agar. Chlamydospores were present in the cultures but no spindles. Inoculation experiments on guinea-pigs gave negative results.

Searle (G. O.). **The rotting of textiles by micro-organisms. I. A laboratory test.**—*Journ. Textile Inst.*, xx, 7, pp. T 162–T 174, 5 figs., 2 graphs, 1929.

After discussing the loss of strength in textiles, particularly heavy canvases and tent ducks, caused by fungi and bacteria [cf. *R.A.M.*, viii, p. 38], the author describes a laboratory test made to compare the resistance of various linen and cotton cloths to attack by the organisms. Strips of a size suitable for a Goodbrand cloth-testing machine were bound round filter candles previously covered with a thin layer of standardized soil suspension (the organisms concerned being mostly those found commonly in soil); the samples were folded so as to secure the maximum contamination towards the centre of the strip, kept in an incubator, and the strips tested for strength at intervals. Dense growths of *Penicillium* and other moulds developed on the outer folds, and were sometimes found even on that part of the fabric in close contact with the candle surface, though this usually became covered with bacterial slime. No attempt was made to isolate the organisms concerned, but conclusive evidence was obtained, from the nature of the attack, that it was due to micro-organisms and not to any chemical cause. The general appearance of the centre of the strips, where the break almost invariably occurred, suggested that the cause of the decay was predominantly bacterial, although the outer folds, which were somewhat drier and heavily infected with moulds, also became noticeably weak. At all stages cotton duck samples were much more heavily infected with moulds than was linen duck, the commonest fungus being a species of *Stachybotrys*. No appreciable difference, however, was observed between the resistance to rotting of a cotton duck and a linen duck tested by this method over a period of six weeks.

Evidence is adduced to show that the viscosity in cuprammonium of cloths 'tendered' by micro-organisms [ibid., iv, p. 281] is the same as that of normal cellulose; this is suggested as a basis for distinguishing between microbiological decay and light tendering, as the latter causes a considerable drop in the viscosity values.

White (H. L.). **Wilt disease of the Carnation.**—*Fourteenth Ann. Rept. Cheshunt Agric. and Res. Stat., Hertfordshire, 1928*, pp. 62–75, 1 diag., 1929.

Carnation wilt in England is stated to be caused mainly by species of *Fusarium*, including *F. culmorum*, *F. acuminatum*, *F. anthophilum*, and *F. herbarum* [*R.A.M.*, viii, p. 788]. No correlation has been observed between the various types of infection and the different species causing the disease. In addition to the strains of *Fusarium* isolated from carnations, strains of *F. culmorum* from aster, chrysanthemum, and tomato, growing in situations where carnations had not previously been planted, were found to be pathogenic to the latter. *F. culmorum* also caused potato and aster wilt, and produced lesions in tomato stems. *F. sporotrichioides* [ibid., iv, p. 274; viii, p. 213], associated with bud rot of carnations, was also found capable of causing wilt.

In commercial nurseries the root disease type of infection makes the most rapid and extensive progress. Little commercial importance attaches to the aerial infection of cut stems. Infection is spread by the dispersion of the spores by air currents, water, and soil contamination, while there is strong presumptive evidence that *F. culmorum* is present in virgin soil. Infection almost invariably occurs through wounds inflicted during cutting, potting, and other cultural operations. The elimination of these sources of infection, coupled with the development of resistant varieties and steam sterilization of infected beds, is considered to offer the best solution of the wilt problem. Rotation of carnations with tomatoes (the most suitable glasshouse crop for the purpose) is not likely to prove effectual.

Williams (P. H.). **A bacterial disease of the Chrysanthemum.**—*Fourteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1928*, pp. 40–42, 1929.

The bacterium responsible for the rotting of chrysanthemum flower-buds and stalks, previously described by the author [*R.A.M.*, vii, p. 722], has been compared with *Bacterium vesicatorium*, and the results [which are tabulated] of the investigation have shown that the organisms are distinct. When inoculated into chrysanthemum plants, *Bact. vesicatorium* gave negative results, while the chrysanthemum organism produced definite lesions from which it was successfully reisolated.

Van Hook (J. M.). **Some new species of fungi.**—*Proc. Indiana Acad. Sci.*, xxxviii (*1928*), pp. 131–132, 1929.

Cercospora cynoglossi n. sp. forms greenish-brown, circular or oval spots on living leaves of *Cynoglossum officinale*. The reddish-brown, tufted conidiophores measure 25 to 150 by 2·5 to 4 μ and bear 6 to 8 hyaline, straight or curved, 3- to 10-septate conidia, 40 to 155 by 2·5 to 4 μ (average length 65 to 70 μ).

Three new fungi are described on the leaves of *Rosa setigera*. *C. rosae* produces circular, oval, or angular, amphigenous, purplish-black (later olive- to hair-brown) spots. The conidiophores develop in tufts from tuberculate bases up to 25 μ broad and measure 60

to 100 by 4 to 6 μ. The brown, curved or straight, 4- to 7-septate conidia measure 30 to 95 by 5 to 7 μ (mostly 65 by 6 μ with 5 septa). This species differs from *C. rosicola* in its much larger conidiophores and conidia, and from *C. rosigena* in its smaller spots and thicker spores. *Phyllosticta indianensis* forms minute, circular or irregular, pale to buff-coloured, purple-bordered spots. The pycnidia are few and measure 50 to 90 μ (mostly 75 μ) in diameter. The spores are ovate to elliptical, 12 to 17 by 6 to 8 μ (mostly 12·5 by 7·5 μ), and surrounded by a dense gelatinous envelope 2 to 3 μ thick. *P. rosae-setigerae* forms walnut-brown, circular or semi-circular spots, usually with chestnut-brown centres and broad dark purple margins. The very numerous prominent, spherical pycnidia measure 75 to 100 μ in diameter, and the hyaline, fusiform to tapering cylindrical, uni- or bi-guttulate spores 8 to 12 by 2 to 3 μ.

MAINS (E. B.). **Observations concerning diseases of Iris and Tulip.**—*Proc. Indiana Acad. Sci.*, xxxviii (*1928*), pp. 93–102, 11 figs., 1929.

Semi-popular notes are given on some iris and tulip diseases, which were very prevalent at Lafayette, Indiana, during 1928. *Bacillus carotovorus* [*R.A.M.*, viii, p. 312] caused a slimy rot of the base of iris plants at flowering time. Infection starts either in the rhizome or at the leaf bases and spreads upwards. Finally the lower part of the stalk breaks and the interior of the rhizome dries up into a granular brown powder surrounded by the persistent epidermis. Infection probably occurs through wounds, such as those made by boring insects. The most severely infected bearded varieties were Blue Jay, Nibelungen, Quaker Lady, Queen Caterina, and Purple King, while a number of Rosa Bonheur bulbs were completely destroyed. *Iris laevigata*, *I. spuria*, *I. halophila*, and *I. setosa* showed considerable rotting associated with borer infestation. Carrots in the same garden were also heavily infected by *B. carotovorus*.

Sclerotial rot, usually referred to *Sclerotium rolfsii*, but identified by Whetzel in 1927 as *S. delphinii* [ibid., vi, p. 617; vii, p. 494; viii, p. 312], also attacks the leaf bases of iris, causing collapse and death.

Didymellina iridis [*D. macrospora*: ibid., iv, p. 707; viii, p. 312] produces yellowish lesions with brown margins on the leaves, which are ultimately killed. Moderate infection occurred in 1928 on a large number of species and varieties, but 15 species (including *I. versicolor*, *I. sibirica*, *I. kaempferi*, and *I. setosa*) and the Dorothy K. Williamson variety were immune. The disease is controllable by sanitary measures, which are indicated.

Rust (*Puccinia iridis*) [ibid., v, p. 33] was introduced into the writer's garden in 1928 for the purpose of studying varietal susceptibility to this fungus. Severe infection occurred on *I. halophila*, *I. xiphoides* (Royal Blue), *I. missouriensis*, and *I. setosa*, while *I. stylosa*, *I. sibirica*, *I. fulva*, and a number of other species and varieties [which are listed] were highly resistant. Investigations still in progress indicate the existence both of physiological strains of the rust and of strains of varying susceptibility within the different iris species. Teleutospores are apparently seldom

formed in the eastern part of the United States, the fungus surviving the winter in the uredo stage on the living leaves of infected plants. These should be destroyed and the plants dusted with sulphur.

Tulips were severely attacked by *Botrytis tulipae* [ibid., viii, p. 40].

PARLANE (B.). **An epidemic occurrence of Ustilago comburens Ludwig on Danthonia pilosa R.Br., an unrecorded host for New Zealand.**— Reprinted from *Trans. New Zealand Inst.*, lx, 6 pp., 2 pl., 1 fig., 1929.

A description is given of an epidemic outbreak in 1928 of the smut *Ustilago comburens* on the grass *Danthonia pilosa* in certain parts of the Nelson district of New Zealand. This is stated to be a new record of the fungus on this host for the island. Sheep grazing on the infected pastures showed a slight affection of the mucous membrane of the nose due to irritation caused by inhaling the smut spores, and a noticeable dark discoloration of their wool, caused by the incrustation of the hair with the greenish-bronze spores. Details are also given of the germination of the spores of *U. comburens*.

DRECHSLER (C.). **Occurrence of the zonate-eyespot fungus Helminthosporium giganteum on some additional grasses.**— *Journ. Agric. Res.*, xxxix, 2, pp. 129–135, 6 pl., 1929.

Brief descriptions are given of the pathological symptoms caused by the zonate-eyespot fungus (*Helminthosporium giganteum*) on eleven grasses, including species of *Agrostis, Eragrostis, Festuca, Pennisetum*, and *Phalaris*, which were found to be naturally infected by it in the experimental grass plots at the Arlington Experiment Farm, Virginia. These grasses are stated to have been hitherto unrecorded as hosts of *H. giganteum*, and are additions to those that were listed in a previous paper [*R.A.M.*, viii, p. 384].

ROBERTSON (W. H.). **Report of Provincial Horticulturist and Inspector of Fruit Pests.**—*Twenty-third Ann. Rept. Dept. of Agric. British Columbia for the year 1928*, pp. O 19–O 29, 1929.

The following items of phytopathological interest occur in this report. Attempts to control cherry blossom blight (*Monilia oregonensis*) [probably *Sclerotinia cinerea* f. *pruni*: *R.A.M.*, viii, pp. 156, 253] by the application of 8–8–40 Bordeaux mixture were again unsuccessful.

Dusting with sulphur-lime (6–4) once more proved inferior to spraying with lime-sulphur (1 in 30 for the pink spray and 1 in 35 for the two subsequent ones) in the control of apple scab (*Venturia inaequalis*) [loc. cit.]. The percentage of clean fruit on the sprayed plot was 88 compared with 68 on the dusted and 52 on the control. A spray warning service in connexion with this disease was instituted on a small scale in the Kootenays. Just as the ascospores on old leaves were reaching maturity the growers were advised to apply the first spray, the McIntosh Red trees at this time being at the cluster-bud stage. The postponement of the first application until the pink stage resulted in the develop-

ment of secondary infection [cf. ibid., viii, p. 110 *et passim*]. Very good control of anthracnose of apples (*Neofabraea malicorticis*) [ibid., viii, pp. 49, 50] was obtained at Kaslo in the Kootenays by the application of 1–1½–40 Burgundy or 4–4–40 Bordeaux mixture. Of the 17,916 acres of [apple] orchards inspected for fireblight (*Bacillus amylovorus*), 17,171 were passed as free from infection.

The number of compulsory spraying zones [ibid., viii, p. 156] has been increased from two to four, and a further extension of this important work is planned.

Goodwin (W.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxvi, pp. 34–46, 1929.

During 1928 further tests in the control of apple scab [*Venturia inaequalis*] were made at the South-Eastern Agricultural College, Kent, in which 12 Allington Pippin and 12 Newton Wonder trees were sprayed with Bordeaux mixture made with commercial hydrate of lime, and a further 12 trees of the former variety and 15 of the latter sprayed with ordinary Bordeaux mixture made with quicklime [cf. *R.A.M.*, vii, p. 788]. Spraying was carried out on 27th April, 21st May, and 18th June, 12 Allington Pippins and 15 Newton Wonders being left unsprayed as controls.

The results [which are tabulated] again indicated that the fungicidal properties of both mixtures are identical and highly satisfactory.

The quantity of infected apples in the unsprayed Allingtons amounted to 82 per cent., and in the unsprayed Newton Wonders to 83 per cent. by weight of the crop. In the plots sprayed with the hydrate of lime mixture the figures were only 12 and 14 per cent. for the Allingtons and Newton Wonders, respectively, while in those treated with ordinary Bordeaux mixture they were 12 and 17 per cent. for the same two varieties, respectively.

No appreciable leaf scorch resulted from the spraying, while russeting of the fruit was appreciable only in 3·1 to 3·7 per cent. of the Allingtons and 0·14 to 0·28 per cent. of the Newton Wonders.

In 1927 a test was conducted on Worcester Pearmain apples, in which two plots of 68 and 66 trees were given, respectively, applications of Bordeaux mixture and a proprietary Bordeaux paste, bordorite, on 3rd and 20th May and 10th June, two other plots, each of 70 trees, receiving only the last two applications of the mixture or paste. In 1928 this test was repeated on exactly the same lines on 2nd and 24th May and 19th June; in both years two plots (40 and 30 trees) were left unsprayed as controls.

The results [which are tabulated] showed that in 1927 infection in the untreated controls amounted to 61 and 78 per cent., respectively, by number, of the total crop, while the plots which received three and two applications of Bordeaux mixture showed, respectively, 44·6 and 39 per cent. of the crop scabbed. The plot given three applications of the paste showed 71 per cent. scabbed. Considering the 1927 results as a whole, the spraying nearly doubled the percentage of scab-free fruit, while the Bordeaux paste gave no control. In 1928 infection was very severe, both the control plots

and the plots treated with the paste showing 100 per cent. infection, while those given two or three applications of the mixture each showed 96 per cent. scabbed fruit.

In neither year did three applications, including one at the pink bud stage, give better control than two; it was noted that in 1927 no early infection of the opening leaves took place, whereas in 1928 these were generally infected before the first spraying was applied.

The failure to control the disease in 1928 is attributed to early and continued infections by ascospores arising from perithecia on the dead leaves of the previous season, which remained on the ground in the grassed-over Worcester Pearmain plantation, whereas the Allington Pippin and Newton Wonder trees were clean cultivated by repeated digging and hoeing.

HOUGH (W. S.). **Orchard spraying and spray equipment.**—*Virginia Agric. Exper. Stat. Bull.* 260, 12 pp., 4 figs., 1928. [Received October, 1929.]

Technical details are given concerning the various types of spraying apparatus suitable for orchard use, with notes on the results of four years' experiments in the application of different kinds of equipment at Winchester, Virginia [cf. *R.A.M.*, viii, p. 586]. It was found that sprayers of about 20 galls. capacity per minute are the best for apple orchards over 25 years of age. As a rule, the pressure should not exceed 300 to 325 lb. (400 lb. at the outside, and not more than 250 to 275 lb. for machines of 8 to 10 galls. capacity). A nozzle with six holes, each measuring $\frac{1}{12}$ or $\frac{1}{16}$ inch in diameter, in the whirl disk, gives a very desirable type of spray cone which is carried three times further (12 to 15 ft.) than the fan-like cone produced by the same nozzle with only two holes.

KIDD (Mrs. M. N.). **Fungal wastage in the overseas transport and marketing of New Zealand Apples.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1928*, pp. 34–35, 1 graph, 1929.

During 1928, experiments were conducted by the Food Investigation Board in collaboration with the New Zealand Department of Scientific and Industrial Research and the shipping companies concerned to investigate the effects of inequalities of temperature in refrigerated holds upon Cox's Orange Pippin, Jonathan, and Sturmer Pippin apples taken from three localities. At the same time the consignments were surveyed to determine the fungi responsible for wastage through decay. After three weeks the wastage in these varieties was, respectively, 8·5, 5, and 4·5 per cent., while a week later the figures rose to 12, 6·5, and 9, respectively. Most of the wastage in the Cox's Orange Pippin was due to *Diaporthe perniciosa* and in the other apples to *Physalospora cydoniae*. It is considered that the difference in specific fungal infection may be due either to the locality of origin or the variety.

[This paper is reprinted in *New Zealand Journ. of Sci. & Techn.*, xi, 1, pp. 30–32, 1929.]

HORNE (A. S.). **Biological work.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1928*, pp. 96–107, 6 graphs, 1929.

Further investigations into the resistance of stored apples to fungal invasion [cf. *R.A.M.*, viii, p. 251] showed that when individuals of a uniform population were inoculated with a fungus capable of invading them, the rate of invasion did not remain constant but increased or decreased according to the fungus or the variety of apple.

When Cox's Orange Pippin apples were inoculated with various [named] fungi, the rate of invasion decreased during storage; a further experiment with the same variety gave comparable results. When Bramley's Seedling apples were inoculated with *Cytosporina ludibunda* [ibid., vii, p. 585 and loc. cit.] the rate of invasion increased during storage, but the increase gradually diminished.

The acidity of apples falls during storage, the P_H value of Bramley's Seedlings being altered from 3 to 4, approximately. When apples of this variety were inoculated with *C. ludibunda* and stored at 20° C., it was found that the decrease in the amount of acid was associated with an increase in the rate of invasion.

A high correlation, 0·737 (eliminating the effect of potash), obtains between the rate of fungal invasion and the nitrogen content of Bramley's Seedling apples [cf. ibid., vii, p. 586]. The data were obtained from sets of 100 apples from six localities; a table is given showing the locality, nitrogen and acid content as percentages of the fresh weight, and the rate of fungal invasion in centimetres per diem. From this it appears that the rate of invasion and the nitrogen content run parallel, while an increase in the acid content is associated with a reduced rate of invasion; a high acid and low nitrogen content are associated with a low rate of invasion, the converse also being true.

Investigations also showed that a fungus which is comparatively innocuous early in the storage life of apples may cause considerable damage later; conversely, one capable of causing serious wastage early in the storage life may cause less loss if infection occurs later. Apples resistant to internal breakdown are not necessarily resistant to fungal invasion.

WEST (C.). **Investigations on the storage of fruit.**—*Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1928*, pp. 36–38, 1929.

Storage trials [brief details of which are given] with English home-grown apples showed that for each variety tested there is a critical lower limit of temperature below which the fruit rapidly deteriorates. Very numerous tests made to ascertain how far the exact stage of maturity of the fruit at gathering influences its subsequent history showed definitely that this factor is of cardinal importance as regards quality and storage life. Bramley's Seedling apples gathered on 25th September and stored at 34° F. showed only 5 per cent. internal breakdown on 24th March, when others of the same variety picked on 6th October and similarly stored showed 50 per cent. breakdown; James Grieve apples

gathered on 17th August and stored at about 60° were perfectly healthy on 15th October, when others of this variety, similarly stored, but picked on 13th September, showed 40 per cent. inherent internal breakdown.

CULPEPPER (C. W.) & MOON (H. H.). **Sulphur-spray residues and the swelling of tin cans packed with Peaches.**—*Journ. Agric. Res.*, xxxix, 1, pp. 31–40, 1929.

The purpose of the investigation reported in this paper was to throw some light on the causes of the swelling frequently observed in tins of preserved peaches, especially when the fruit was not freed before packing from the residues of sulphur-containing sprays applied for the control of the brown rot fungus [*Sclerotinia americana*]. The results of experiments made in 1925 and 1926 appear to indicate that a rather adequate explanation of the phenomenon may be found in the electrochemical theory of corrosion. Under usual conditions, the acid juices of the peach in the tins act as an electrolyte, in which iron is cathodic to tin, but if a reducing agent such as hydrogen sulphide is present, the relationship is reversed, and iron is anodic to tin when they are in contact. This reversed relationship of the metals, together with the fact that hydrogen sulphide accelerates the liberation of hydrogen from iron, seems to account completely for the swelling of the tins in the cases studied.

WALLACE (T.). **Investigations on chlorosis of fruit trees. IV. The control of lime-induced chlorosis in the field.**—*Journ. Pomol. and Hort. Sci.*, vii, 4, pp. 251–269, 1929.

A full account is given of investigations into the value of sprays and cover crops in the commercial control of lime-induced chlorosis of fruit trees [*R.A.M.*, v, p. 498]. The results obtained showed that the effects of ferrous sulphate sprays are uncertain, considerable damage sometimes resulting from their use. Aluminium sulphate was quite ineffective. Considerable control, however, was obtained by growing permanent cover crops over the root systems of the affected trees. The mechanism of the action of cover crops was not investigated, but it is thought that, when effective, they influence the functioning of iron in the tree, either by increasing the intake of iron or by rendering active some portion of the iron already contained in the tissues.

SCHOEVERS (T. A. C.). **Een proef met zwavelzure kali tegen 'randjesziekte' bij Roode Bessen.** [An experiment with potassium sulphate against 'leaf edge disease' of Red Currants.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 56, pp. 7–10, 1 col. pl., 1929.

Of recent years the so-called 'leaf edge' [or 'leaf scorch'] disease [the symptoms of which are briefly described] has assumed increasing importance in Holland, especially on currants and apples [*R.A.M.*, ii, p. 488; iv, p. 716]. A considerable improvement in the condition of affected red currants (German sour variety) was obtained by the application of lime at the rate of 7,000 to 8,000 kg. or 15,000 kg. lime marl per hect., while practically complete

control was given in a subsequent experiment (March, 1928) by treatment with potassium sulphate (1,200 kg. per hect.) [cf. ibid., vii, p. 728]. Patent potash may be substituted for potassium sulphate, but should be applied at double rate (2,400 kg. per hect.).

[This paper is reprinted in *Tijdschr. over Plantenziekten*, xxxv, pp. 231–233, 1 col. pl., 1929, and a German version appears in *Ernähr. der Pflanze*, xxv, 13, pp. 297–300, 2 figs., 1929.]

Alcock (Mrs. N. L.). **A root disease of the Strawberry.**—*Gard. Chron.*, lxxxvi, 2219, pp. 14–15, 4 figs., 1929.

Since October, 1928, the writer has examined some fifty batches of strawberry plants, of which about half were affected by the so-called 'Lanarkshire disease' [*R.A.M.*, vii, p. 524], and came from Lanarkshire, while the remainder were presumed to be healthy and came from north-east Scotland, the Edinburgh district, and the Isle of Man.

The typical symptoms of the disease [which are described] were observed in every one of the 105 diseased plants sent, in some of which the roots showed a definite die-back from the tips and a marked absence of laterals, while a less common symptom was the presence of discoloured areas on the surface tissues of the root, not involving the tip. The pale, stout adventitious roots formed in the late summer and autumn showed a conspicuous greyish-brown discoloration proceeding from the tip backwards.

A fungus was invariably found in the tissues of the discoloured central woody cylinder of decaying roots, the brown region between the blackened tip and the pale, still healthy, part of the adventitious roots below a crown being most frequently occupied. The fungus proceeds upwards in the central cylinder before the surrounding cortical tissues show any visible changes, so that the latter can be scraped away and a reddish infected core left. The constant presence in this part of spherical oospores (33 to 47 μ in diameter with a wall 4 μ thick) enclosed in piriform oogonia averaging about 46 or 47 μ, to each of which there is attached a definitely amphigynous antheridium, led to the identification of the fungus as a species of *Phytophthora*. The organism makes a good growth when pieces of infected root are placed in sterile water, producing mycelium and sporangia measuring about 50 by 30 μ, spherical when young and later usually becoming inversely piriform. No papilla is present, the apex of the sporangium being blunt and the wall, in this region, thickened and hyaline. After the emission of the zoospores, a second sporangium, with a longer or shorter stalk, may proliferate into the interior of the first, and this process may be repeated.

Seven apparently healthy young strawberry runners planted in a pan of sterile sand with an admixture of infected roots developed the typical symptoms of the Lanarkshire disease in six weeks.

Numerous attempts to secure pure cultures of the strawberry *Phytophthora* gave negative results, the work having been complicated by the frequent presence of a rapidly growing species of *Pythium*. Pending further investigations the adoption of the name 'red core root' for the Lanarkshire disease is recommended.

O 'mal da Banana' nos Bananaes do Equador. Conselhos para debellar o 'mal da Banana'. [The 'Banana disease' in the Banana plantations of Ecuador. Recommendations for the control of the 'Banana disease'.]—*Bol. de Agric. São Paulo*, Sér. xxx a, 3–4, pp. 278–281, 1929.

The occurrence reported in this paper of the Panama disease of bananas (*Fusarium cubense*) in the Bucay district of Ecuador is regarded as a grave menace to the Brazilian industry. The symptoms of the disease are described in popular terms, and directions are given for its control by sanitary measures, including the cultivation of immune or resistant varieties, e. g., Chinese or Dwarf [*Musa cavendishii*], and the disinfection of all planting implements, &c., with a bichloride of mercury solution (1 in 50) or 25 per cent. copper sulphate.

Carughi (A.) & Paoloni (C.). **I mezzi chimici nella lotta contro le malattie delle piante.** [Chemical methods in the campaign against plant diseases.]—358 pp., 6 col. pl., 7 figs., Milan, U. Hoepli, [? 1929. Abs. in *Chem. Zeit.*, liii, 81, p. 792, 1929.]

The standard chemical methods of plant disease control are discussed in the light of modern research, with directions for their application under various conditions. An account is given of the preparation and use of a number of fungicides and insecticides, including sulphur, copper, arsenic, and fluorine compounds; mineral, resin, and animal oils; plant extracts; fumigants; and seed and soil disinfectants.

Goodwin (W.), Martin (H.), & Salmon (E. S.). **The fungicidal properties of certain spray-fluids, V.**—*Journ. Agric. Sci.*, xix, 3, pp. 405–412, 1929.

Further investigations into the fungicidal value of various sprays as tested by their action on the conidial stage of hop mildew (*Sphaerotheca humuli*) [cf. *R.A.M.*, v, p. 566] showed that when a pure monohydrated dicalcium hydrogen arsenate was used with a 0·5 per cent. gelatine spreader it was fungicidal at a strength of 0·0125 per cent. arsenic oxide, but not completely effective at 0·006 per cent. The lower effective concentration of arsenic oxide than in earlier experiments [ibid., ii, p. 168] is attributed to the more basic calcium arsenate formerly used and the free lime present in the 1 per cent. lime casein added as a spreader which resulted in the production of a still more basic calcium arsenate.

It appears to be established that the immediate fungicidal action of the calcium arsenates depends upon the amount of arsenic present in solution. The addition of free lime, by causing a temporary precipitation of the soluble arsenic, brings about a loss of fungicidal properties, but the action of atmospheric carbon dioxide ultimately removes the excess of lime in the form of calcium carbonate, and restores the dicalcium arsenate [ibid., vi, p. 109].

To ascertain whether the association of sulphur with arsenic in the calcium thioarsenates would confer a greater fungicidal power than is shown by the arsenic of the calcium arsenates themselves, attempts were made to compare certain calcium thioarsenates with

dicalcium hydrogen arsenate. Two such solutions (neither quite pure) were used, calcium thioarsenate I which gave on analysis 0·229 gm. arsenic (as As_2O_5) and 0·0807 gm. sulphur per 100 c.c., the molecular ratio of arsenic oxide to sulphur, $As_2O_5/2 : S = 1 : 1·27$, indicating the preponderance of the dicalcium hydrogen monothioarsenate, and calcium thioarsenate II which gave 0·545 gm. arsenic (as As_2O_5) and 0·556 gm. sulphur per 100 c.c., the molecular ratio 1 : 3·67 indicating the presence of higher thioarsenates than in solution I. In all the tests 0·5 per cent. gelatine was added as a spreader.

It was found that calcium thioarsenate II was fungicidal and caused no scorching at a strength equivalent to 0·006 per cent. As_2O_5, but that at a concentration equivalent to 0·003 per cent. As_2O_5 both solutions were below fungicidal strength. Solution I appeared to cause more scorching than II, and both caused more than dicalcium arsenate, though superior in fungicidal properties. As calcium thioarsenates are formed when lime-sulphur is mixed with lead or calcium arsenate they are regarded as a main factor in the production of the increased fungicidal power of the mixed spray. While it is not impossible that lead thioarsenate is formed and plays a part in the lime-sulphur lead arsenate spray, the view is favoured that it is rather the calcium thioarsenates together with calcium arsenates which are responsible for the increase in fungicidal power.

Quantz (J. J.). **Pflanzenschutzwanderausstellung als Mittel zur Produktionsförderung.** [Travelling plant protection exhibition as a means of increasing production.]—*Obst- und Gemüsebau*, lxxv, 8, pp. 146–148, 4 figs., 1929.

An account is given of the travelling plant protection exhibition which visited Pillnitz (Saxony) on 6th and 7th July, 1929. Demonstrations were given on the preparation and application of fungicides, the various types of spraying apparatus, the histology and pathology of grafting, and the like.

Schlumberger (O.). **Saatenanerkennung und Pflanzenkrankheiten im Jahre 1928.** [Seed certification and plant diseases in 1928.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, ix, 7, pp. 59–60, 1929.

The work of seed certification in Germany during 1928 was conducted on the usual lines [*R.A.M.*, vii, p. 816]. The entire area inspected comprised nearly 159,000 hect., and the total percentage of disease among the various crops was as follows: rye 9·9 (compared with 8·3 in 1927); wheat 17·7 (15·7); barley 28·2 (30); oats 4·1 (12·4); and potatoes 42·1 (43·5) [45·5 in last year's report]. The percentage distribution of individual diseases was as follows: wheat bunt [*Tilletia caries* and *T. foetens*] 3·7 (compared with 1 in 1927); loose smut of wheat [*Ustilago tritici*] 0·65 (0·6); combined covered and loose smuts of barley [*U. hordei* and *U. nuda*] 0·8 (4·3); loose smut of oats [*U. avenae*] 0·45 (1·3); and flag smut of rye [*Urocystis occulta*] nil (0·02).

There was a considerable rise in the incidence of potato blackleg

[*Bacillus phytophthorus*: ibid., viii, p. 396] and virus diseases during the period under review, while *Phytophthora* [*infestans*] was much less prevalent than usual on account of the dry weather.

HERRICK (H. T.) & MAY (O. E.). **Molds and chemical manufacture.**—*Indus. & Engin. Chem.*, xxi, 7, pp. 618–621, 1929.

The history of the application of moulds to various processes of chemical manufacture is briefly summarized from the earliest times, and some observations are made on the current methods of utilizing *Aspergillus*, *Penicillium*, and *Mucor* spp. in the production of citric acid, gluconic acid, and alcohol, respectively.

DUFRÉNOY (J.). **Études cytologiques relatives aux maladies à virus.** [Cytological studies relating to virus diseases.]—*Phytopath. Zeitschr.*, i, 2, pp. 151–167, 13 figs., 1929.

The writer here summarizes his observations, together with those of other workers, on the cytological relations of plants affected by certain virus diseases. These researches have already been noticed from other sources [*R.A.M.*, viii, p. 518, and below, p. 50].

MÜNCH (E.). **Ueber einige Grundbegriffe der Phytopathologie.** [On some fundamental concepts of phytopathology.]—*Zeitschr. für Pflanzenkrankh. (Pflanzenpath.) und Pflanzenschutz*, xxxix, 7, pp. 276–286, 1929.

In the course of this general discussion on the basic conceptions of phytopathology, the writer suggests the following definitions. Parasitism is the nourishment of the fungus on substances derived from the living cells of the host which, in the first place, remain alive. Necrophytism proper is sustenance from dead material; its subdivisions are perthophytism in which the dead substratum consists of parts of the living host plant either killed by the fungus in advance of its growth or that have become naturally non-living; and saprophytism, wherein the substratum is already dead from other causes. Further subdivisions, based on the mode of nutrition of the heterotrophic organisms, are proposed.

KÖHLER (E.). **Die Resistenzfrage im Lichte neuerer Forschungsergebnisse.** [The problem of resistance in the light of recent investigational results.]—*Centralbl. für Bakt.*, Ab. 2, lxxviii, 8–15, pp. 222–241, 1 diag., 1929.

This is a general discussion, illustrated by some well-known examples, of various aspects of the relations between fungous parasites and their hosts. Resistance is defined as the sum-total of those constitutional properties of the host which diminish the activity of the parasite. The circle of affinity of a parasitic fungus embraces all those orders, families, genera, species, or varieties which stimulate the fungus to some form of contact with the host—either by direct penetration, formation of haustoria, or secretion of toxins—in order to derive nourishment from its cell contents. Beyond this circle of affinity (comprising varying degrees of resistance and susceptibility) lies immunity, i.e., a completely indifferent relation between parasite and host. In connexion with a survey

[accompanied by tables] of the problem of biological specialization, it is pointed out that a high degree of specialization is compatible with the existence of only a few infection factors on the one hand, and resistance (or susceptibility) factors on the other. Most of the recent literature mentioned in the bibliography has been noticed in this *Review*.

GOLDSCHMIDT (V.). **Vererbungsversuche mit den biologischen Arten des Antherenbrandes (Ustilago violacea Pers.). Ein Beitrag zur Frage der parasitären Spezialisierung.** [Inheritance experiments with the biological strains of anther smut (*Ustilago violacea* Pers.). A contribution to parasitic specialization.]—*Zeitschr. für Bot.*, xxi, 1–2, pp. 1–90, 22 figs., 12 graphs, 1928.

A general discussion on the bearing of specialization in parasitic fungi on genetic research is followed by a comprehensive account, accompanied by numerous tables, of the author's experiments on the inheritance of specialization in hybrids of six biological strains of anther smut (*Ustilago violacea*) [*R.A.M.*, v, p. 491]. In certain of these crosses evidence was obtained that the differences in specialization are based on a single Mendelian gene. Infection with haploid strains failed.

WILLE (F.). **Puffergrösse und Befall von Pflanzenkrankheiten. (Vorläufige Mitteilung.)** [Buffer content and infection by plant diseases. (Preliminary note.)]—*Centralbl. für Bakt.*, Ab. 2, lxxviii, 8–15, pp. 244–245, 1929.

In connexion with a study on the role of the buffer content in determining the reaction of plants towards certain fungous diseases, as well as towards smoke and gas injury, the writer ascertained [by a technique which is briefly described] that the lowest buffer content of aqueous solutions of the leaves of seven conifers and eight vine varieties frequently coincides with the occurrence of the diseases under consideration (*Lophodermium* [*pinastri*] and *Hypodermella* [*sulcigena*] on *Pinus silvestris* and *Plasmopara* [*viticola*] and *Pseudopeziza* [*tracheiphila*] on Gros Rhin, Muscat, and Rèze vines [*R.A.M.*, vi, p. 683]). This period is further characterized by a relatively low ash content and a high degree of assimilatory activity. The buffer content of young conifer needles is generally lower than that of old ones. Susceptibility to gas and smoke injury appears to be due to a chemical alteration of the chlorophyll iron rather than to any readjustment in the equilibrium of the plant organism.

PORTER (C. L.) & BOCKSTAHLER (H. W.). **Concerning the reaction of certain fungi to various wave lengths of light.**—*Proc. Indiana Acad. Sci.*, xxxviii (*1928*), pp. 133–135, 1929.

Experiments were carried out in a specially constructed dark room in a greenhouse to determine the effect on *Colletotrichum lindemuthianum*, *Cephalothecium* [*Trichothecium*] *roseum*, *Sclerotium rolfsii*, and *Sclerotinia* sp. of (*a*) various wave-lengths of light confined to the visible spectrum, and (*b*) extremely short

wave-lengths of the non-visible ultra-violet rays [*R.A.M.*, viii, p. 190].

Cambosco (Cambridge Botanical Supply Co.) spectro-radioscopic glass filters were used for the visible light tests and were placed at the bottom of light-proof boxes in which were suspended tungsten filament electric globes of appropriate candle-power. The fungi did not react to any appreciable extent to the varying wave-lengths thus obtained, except by a tendency to slower growth which was specially apparent under a blue-green light. *Colletotrichum lindemuthianum* exhibited malformations of the hyphae under certain filters.

The ultra-violet radiations were obtained from a Cooper-Hewitt quartz mercury arc, the distance of exposure being 60 cm. and the duration ranging from 5 seconds to 60 minutes. Relatively short exposures to these radiations caused perceptible inhibition of growth, followed by collapse and probably death of the aerial hyphae. Spore formation was slightly accelerated in *C. lindemuthianum*, while in *T. roseum* it was sharply inhibited. With the exception of *Sclerotinia* sp., all the cultures recovered on transference to normal conditions after an hour's radiation.

ROSEN (H. R.) & SHAW (L.). **Studies of Sclerotium rolfsii, with special reference to the metabolic interchange between soil inhabitants.**—*Journ. Agric. Res.*, xxxix, 1, pp. 41–61, 7 figs., 1929.

The purpose of the investigation reported in detail in this paper was to study the interaction of two soil-inhabiting fungi in limiting or favouring each other's growth. The organisms used to this end were *Sclerotium rolfsii* (a very severe outbreak of which occurred in 1928 on cantaloupe melons in Arkansas and Virginia), and the cotton wilt fungus *Fusarium vasinfectum*. Preliminary experiments showed that *S. rolfsii* is well able to utilize cellulose for its nutrition. On potato-dextrose agar at various H-ion concentrations it showed itself to be markedly tolerant of acid conditions, growing well at all P_H values from 3 to 6·5. Beginning with P_H 7 and extending into the alkaline range, there was a noticeable falling off in growth of mycelium, as well as in sclerotial development, and growth ceased altogether at P_H 8. On the same medium *F. vasinfectum* grew well throughout the range of H-ion concentration tested, i. e., from P_H 3 to 9. When the two fungi were plated together on dehydrated potato dextrose agar, *S. rolfsii* rapidly outgrew *F. vasinfectum* at P_H values below 6·9, and in time completely covered the latter, while the converse was the case around the neutral point and in the alkaline ranges. Alkaline media in which *F. vasinfectum* had grown for some days became sufficiently changed in reaction to permit rapid germination and growth of the sclerotia of *S. rolfsii*. When the latter was grown on media originally possessing acid reactions and which had been used for growing *F. vasinfectum* prior to its introduction, it exhibited negative chemotropic responses by refusing to grow in the area immediately around the original colonies. In a final series of experiments it was found that the type and quantity of inoculum of *S. rolfsii*

are very important factors in the capacity of the fungus to overcome reactions of the substratum that are unfavourable to the germination and growth of the sclerotia.

Horne (A. S.) & Das Gupta (S. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. I. On the occurrence of an 'ever-saltating' strain in Diaporthe.**—*Ann. of Botany*, xliii, 171, pp. 417–435, 4 figs., 3 graphs, 1929.

A detailed account is given of saltation in a strain of *Diaporthe perniciosa* isolated from Bramley's Seedling apples [see above, p. 41]. One of the monohyphal subcultures (termed DH_B) produced a strain (DH_C) which differed in the absence of tufted aerial mycelium and in its slower rate of growth in certain nutrient media. Subcultures of this new strain did not show any sectorial differentiation; their growth was entirely homogeneous, and its character did not change with time in any given generation. After six days at room temperature on a standard medium, however, it was found that isolations from the centre of the culture gave a growth differing entirely from the parent growth and closely resembling the original DH_B strain; this saltant from DH_C is termed DH_F. The distance between the interior DH_F area and the outer margin of DH_C remained constant, until the original culture reached the edge of the dish, when the whole was transformed into DH_F.

In certain acid media the growth of the saltant hyphae is favoured and they intermingle with the external DH_C hyphae. On the standard medium, the growing out of the saltant hyphae appeared to be inhibited by the accumulation of alkali produced during growth. Saltation occurred earliest, and the rate of change was most rapid, at the optimum temperature (about 25° C.), and both were delayed at lower temperatures.

The saltant DH_F proved to be highly constant, as it did not show any change except on one occasion when, in malt agar, it produced a sector of DH_C.

The ever-saltating DH_C is believed to be a transitory form which only has a mycelial stage, and is incapable of producing perithecia or pycnidia, while DH_F is capable of producing both.

Dufrénoy (J.). **Observations sur les modifications pathologiques de la forme des vacuoles des cellules végétales.** [Observations on the pathological changes in the shape of the vacuoles of plant cells.]—*Ann. des Épiphyties*, xiv, 3, pp. 227–268, 26 figs., 1929.

A detailed account is given of the morphological and biochemical changes that were observed to occur in the vacuoles of plant cells invaded by parasitic micro-organisms in the case of various fungal and bacterial diseases which are considered under four headings namely: leaf spots, lesions of the cambium, and of buds, and tissue proliferation of roots. Most of the observations have already been noticed from other sources [*R.A.M.*, vii, pp. 549, 555; viii, pp. 419, 457, 518, 677, 678], but the following are new. Leaf cells of *Asphodelus subalpinus* invaded by the rust fungus *Puccinia asphodeli* and which remain green exhibit a fragmentation of their

vacuolar system into a number of small vacuoles. Both in this plant and in *Arisoema triphyllum* rusted by *Uromyces caladii* the large central vacuole is broken up into small ones only in the immediate vicinity of the haustoria, the remainder of the central vacuole remaining whole and with an unaltered vacuolar content. Thus, the survival of the infected cell appears to depend on a localization of the proteolytic process to the area immediately adjacent to the haustoria. The same localization is also observed in orchids which are tolerant of invasion by their endophyte [*Rhizoctonia* spp.], and in the cells of *Rubus* buds invaded by *Fusarium rubi*. In cells of rusted *Asphodelus subalpinus* and *Arisoema triphyllum*, the contents of the small vacuoles in the vicinity of the haustoria form a precipitate when stained with neutral red, probably owing to the fact that they are richer in phenolic compounds, while the contents of the large vacuole stain without precipitating. The study of potato cells invaded by *Phytophthora infestans* and of chestnut cells invaded by *Blepharospora* [*Phytophthora*] *cambivora* showed that those cells which exhibit troubles in their metabolism extending to their vacuolar system are soon killed, but that the parasite can attack from such cells those whose vacuolar system remains normal; when, however, a cell threatened by parasitic invasion is able to accumulate a sufficient amount of phenolic compounds, it dies before invasion can occur with the result that the parasite is also killed.

Tilford (P. E.). **Ohio potato diseases.**—*Ohio Agric. Exper. Stat. Bull.* 432, 38 pp., 22 figs., 1929.

This bulletin, which is a revision of that previously noticed [*R.A.M.*, iv. p. 116], gives brief descriptions of the chief diseases and pests of the potato prevalent in Ohio, together with indications for their control. It combines the facts that have already been presented in the former publication with new information obtained by experimental work carried out during the intervening years, so as to form as complete a treatise as possible of potato diseases for the use of local growers. Special stress is laid on prophylactic measures to prevent the outbreak of the more important diseases.

Goss (R. W.). **The rate of spread of Potato virus diseases in western Nebraska.**—*Journ. Agric. Res.*, xxxix, 1, pp. 63–74, 2 diag., 1929.

Full details are given of the experiments which were conducted from 1924 to 1927, inclusive, at the Scotts Bluff substation, Mitchell, Nebraska, for the purpose of determining the rate at which potato virus diseases spread from year to year in the field under the conditions obtaining in western Nebraska [cf. *R.A.M.*, viii, pp. 551, 552]. The tests were made with the Bliss Triumph potato variety, and were planned on the lines used by Murphy in studying leaf roll [ibid., i, p. 249], and the virus diseases tested were spindle tuber, rugose and mild mosaic, and leaf roll. Transmission of both rugose and mild mosaic was very slight; it only occurred in two of the four years, and could be directly traced to the presence of aphids in the experimental plots. Leaf roll spread a little more extensively, but only to a distance of about three

hills from possible sources of infection: at the end of four years the total of new infections was 9·7 per cent. A correlation was again established between leaf roll spread and aphids, except in 1926, when other insects were probably involved. The largest amount of spread occurred in spindle tuber, new infections amounting to 42·4 per cent. after four years; it occurred in all the four years, but was most abundant in 1925 and 1927, when aphids were present. The spread of this disease could also be correlated with grasshoppers [*Melanoplus* spp.: ibid., vii. p. 662], and some other insects may also have been involved.

The balance of evidence indicated that spindle tuber is the most important disease of the four in western Nebraska, but that leaf roll may develop into a serious problem if it becomes established in the western part of the United States. None of the diseases studied spread more than a few rows from the sources of infection.

MacLeod (D. J.). **The black leg disease of Potatoes (Bacillus phytophthorus (Frank) Appel).**—*Canada Dept. of Agric. Pamphlet* 105, N.S., 10 pp., 3 pl., 1929.

A popular account is given of the symptoms of blackleg of potatoes (*Bacillus phytophthorus*) and of the part played in its transmission by the seed-corn maggot *Phorbia fusciceps* [*P. silicrura*: *R.A.M.*, viii, p. 426], control being recommended along the usual lines [cf. ibid., vii, pp. 261, 595]. Cut seed should be planted immediately in order to minimize any opportunities for the maggot to lay its eggs in the seed pieces.

A useful bibliography is appended.

Jørstad (I.). **Potetkreften i Norge.** [Potato wart in Norway.]—Reprinted from *Beretning fra N[ordisk] J[ordbrugs] F[orsk.]*, Helsingfors, 11 pp., 1 map, 1929.

An account is given of the present situation as regards potato wart [*Synchytrium endobioticum*] in Norway, where the disease is known to occur in 32 parishes of 7 counties, together with notes on past and present legislation against the fungus [*R.A.M.*, vii, p. 480]. It is estimated that about Kr. 240,000 has been spent on control measures from 1st July, 1915, to 30th June, 1928, an average of over Kr. 18,000 a year.

Sansone (F.). **Il Fusarium solani (Mont.) Sacc., in simbiosi mutualistica con batteri nella determinazione di cancrena umida dei tuberi di Patata.** [*Fusarium solani* (Mont.) Sacc. in mutualistic symbiosis with bacteria in the causation of wet rot of Potato tubers.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 2, pp. 170–213, 21 figs., 1929.

A detailed account is given of the author's investigations into a wet rot of potato tubers, first visible as brown or black spots round the lenticels, observed under field and storage conditions in the vicinity of Naples. The disease is considered to be caused by *Fusarium solani* in symbiotic association with bacteria [cf. *R.A.M.*, vi, p. 538]. The rot may be partly dry and partly wet. In a suitable environment the mycelium, when associated with bacteria, can attack perfectly healthy tubers through the lenticels, the

brown areas at first formed gradually spreading over the surface of the tuber, after which wet rot, due mainly to the action of the bacteria, sets in. Inoculation experiments [details of which are given] produced a wet rot when both organisms were present but failed when the bacteria alone were used.

When the mycelium grows in association with the bacteria, and in the presence of air, it forms sclerotia in which bacteria and an oily substance are found. These sclerotia give rise to new mycelium. If very many bacteria are present in the same medium as the mycelium, the latter breaks up into yeast-like cells which sometimes form a whitish layer. In hanging drop cultures these cells germinate by budding.

The examination of stained material revealed the presence of the bacteria not only on the surface, but also within the mycelium and conidia of the fungus. After repeated isolations the latter was to some extent freed from the bacteria, when it was found to be incapable of infecting healthy tubers through the lenticels; when inoculated, however, under suitable conditions, into wounds in the parenchyma, it produced a dry necrosis of the tissues.

De Bruyn (Helena L. G.). **Het blauw worden van Aardappelen.** [The blue discoloration of Potatoes.]—*Tijdschr. over Plantenziekten*, xxxv, 7, pp. 186–222, 2 pl., 1929. [English summary.]

The writer's investigations on the etiology of the blue discoloration of potatoes, which has attracted considerable attention in Holland of recent years, are fully described [*R.A.M.*, viii, p. 459].

Susceptibility to bruising is most marked in tubers that have a relatively high specific gravity and in those tissues of the tuber with the highest specific gravity, namely, usually those occurring at the stem ends of the tubers. The specific gravity of the tubers of Roode Star was diminished by heavy applications of potash, and increased by excess of nitrogen in pot experiments, but in the field this correlation was less apparent. Little change in the bruised cells was detected on microscopical inspection, except for loss of turgor and the formation of a red, later black pigment (melanin) [ibid., viii, p. 598].

Dark spots are frequently observed at or near the stem end of affected tubers. These spots expand and become more numerous during the first months after digging, suggesting that they are caused by an organism. They appear to correspond to necrotic areas situated about 1 mm. below the skin at the edge of the outer phloem. Anatomically they resemble those due to sprain (kringerigheid) [ibid., viii, p. 627]. The incidence of this form of necrosis, which is confined to clay soils, was considerably affected by the type of manure given, being reduced by potash and augmented by nitrogen. Grafting experiments with tubers, carried out to ascertain whether the spots were due to a virus, gave negative results, and thus the etiology of the lesions still remains obscure.

Potatoes with a high specific gravity were found to be much less susceptible to bruising when free from the necrotic spots than when the latter were present. Potatoes with a low specific gravity remained little liable to the blue discoloration following bruising

even when necrotic spots were present, though somewhat more so than when they had no spots. It is concluded that the necrotic spot disease is really the most important factor concerned in the production of the blue discoloration after bruising, though varietal susceptibility and nutritional factors are also concerned.

BEUWENGA (E.). **Kaligehalt und die 'Blaufleckigkeit' der Kartoffeln.** [Potash content and the 'blue spotting' of the Potato.]—*De Veldbode*, Maastricht, 1382, p. 676, 1929. [Abs. in *Ernährung der Pflanze*, xxv, 19, p. 468, 1929.]

The writer examined a number of Bravo potato tubers, grown in 'polders' [drained marshes] in Holland, with a view to determining the relation between the potash content of the soil and the incidence of blue spotting (also termed black discoloration) [see preceding abstract] in the crop.

Sample 1 originated in a completely fertilized heavy clay soil of a reclaimed marsh. There was no blueing in this lot. Sample 2, from reclaimed heavy clay soil, received stable manure and superphosphate. Blueing was present to a slight extent. Sample 3 was taken from a relatively light arable clay soil which received a complete fertilizer. Blueing was fairly prevalent in this lot. Sample 4 came from a light clay reclaimed marsh receiving only stable manure. Blueing occurred in a severe form. Samples 5 and 7, of undescribed origin, were badly diseased, as also was sample 6 from heavy clay soil receiving no fertilizer.

An analysis [the results of which are tabulated] of diseased and healthy tubers showed that the potash content of the former was only about half that of the latter. The potash content of the distal end is somewhat higher than that of the stem end, but not sufficiently so to account for the greater incidence of the disease in the latter region.

KUROSAWA (E.). **On the causal fungus of the 'bakanae' disease of Rice plants, and the experiments of its isolation and infection.**—*Rept. Nat. Hist. Soc. Formosa*, xviii, pp. 380–401, 1928. [Japanese. Abs. in *Japanese Journ. of Botany*, iv, 4, p. (90), 1929.]

Ten out of eleven strains of the supposed causal organism of the 'bakanae' disease of rice [*R.A.M.*, viii, p. 264], which was determined as *Lisea fujikuroi* Saw. [ibid., vii, p. 668], were found to be actually pathogenic to plants inoculated with the conidia and ascospores of the fungus. Rice grains as well as unwounded roots were infected, the degree of virulence varying according to the temperature and nature of the medium. The fungus produces both macro- and microconidia in addition to ascospores.

KUROSAWA (E.). **On the cultural characters of the 'bakanae' disease fungi on various nutrient media and the temperature for their development.**—*Rept. Nat. Hist. Soc. Formosa*, xix, pp. 150–79, 1929. [Japanese. Abs. in *Japanese Journ. of Botany*, iv, 4, pp. (90)–(91), 1929.]

The divergent behaviour of various strains of the fungus causing 'bakanae' disease of rice (*Lisea fujikuroi*) [see preceding abstract]

on different media suggests the occurrence within this organism of a number of distinct physiological races. The shape and colour of the colonies vary on different media: on bean decoction agar they are circular and rarely coloured, while on hulled rice decoction agar they are membranaceous and pale lobelia-violet. The optimum temperature for the development of the fungus lies between 25° and 30° C., with a minimum and maximum at 2° and 40°, respectively.

MURRAY (R. K. S.). **On the occurrence and significance of Oidium leaf disease in Ceylon.**—*Second Quart. Circ. for 1929, Rubber Res. Scheme (Ceylon)*, pp. 7–22, 1 map, 1929.

After briefly reviewing the history of rubber mildew (*Oidium* [*heveae*] in Ceylon [cf. *R.A.M.*, viii, p. 599] and describing the symptoms and effects of the disease, the author states that in a dry district such as Matale the affected leaves show an abundant superficial growth of mycelium and spores on the surface, but that in a wet area such as Kalutara the fungus is seldom visible macroscopically.

In the low-lying parts of the island, where mildew is less severe than in some of the higher districts, the disease usually appears in February or March, is active for a few weeks, and then disappears: a defoliated tree which puts out a second crop of leaves is seldom attacked again, and therefore recovers at the cost of food reserves. Where infection is severe, however, although the disease shows a period of maximum intensity shortly after the normal wintering, the fungus may remain active throughout the year. Many trees are thus subject to five or six periods of leaf fall and renewal, the leaves becoming smaller and poorer at each successive recovery, and the branches ultimately showing, in severe cases, a physiological die-back: *Diplodia* [*Botryodiplodia theobromae*] may effect an entry and kill the branch or the whole tree.

Local observations in the main confirmed Bobilioff's view that the mycelium overwinters on the leaves or branches [ibid., viii, p. 461].

In 1928 out of 233 estates 55 per cent. reported the disease as present, while in 1929 out of 178 estates 77 per cent. reported it.

Contrary to what has been observed in Java, *O. heveae* has become severe in Ceylon only at the higher elevations [cf. ibid., vii, p. 267], and on no estate lower than 1,000 ft. above sea-level has the same degree of defoliation been noted that has occurred on some mid-country estates.

Most estates where a severe attack had been experienced reported that dry weather was a predisposing factor; a few stated that severe attacks occurred during abnormally wet or dry weather, and some considered that alternately wet and dry conditions favoured infection. The author is inclined to agree with the latter view. A relatively dry atmosphere is held to be the most important factor in stimulating spore production, and is tentatively suggested as the chief cause of the severity of the disease in the Matale and Uva districts. Dew probably provides sufficient moisture for germination. The condition of the trees as regards new leaf is, however, probably more important than

specific weather conditions. Trees in an affected area producing new foliage when the fungus is active are highly susceptible.

No evidence was obtained of any individual immunity or resistance, except in so far as concerns trees wintering very early and very late: these may escape. Trees on poor soil and exposed ridges generally suffer more severely than those in the richer hollows, probably because their poorer growth hinders their recuperation. Once infection becomes severe its intensity seldom decreases.

In Ceylon no reduction in yield has been reported [loc. cit.] but there is no doubt that the cumulative effects of the disease must eventually result in a smaller output.

A careful examination of 1,058 trees taken at random in two fields in the Matale district showed that after severe attacks in three consecutive years nearly one-third of the trees were completely defoliated, while not one was unaffected. In low-lying districts no effects comparable with this have been reported, but there are indications that the disease is becoming more prevalent every year.

From observations and reports it appears that heavy dressings of nitrogenous fertilizers are of value in control. Laboratory experiments with 0·5 per cent. sulfinette [loc. cit.] showed that this was highly toxic to *O. heveae* and had a limited vaporous action. Spraying tests with this solution are in progress.

[This paper also appears in the *Tropical Agriculturist*, lxxiii, 2, pp. 92–107, 1929.]

De Vries (O.). **Aanwijzingen voor rui- en meeldauwopnamen.** [Indications for leaf fall and mildew surveys.]—*De Bergcultures*, iii, 53, pp. 1345–1347, 1929.

In connexion with discussions held at the recent rubber mildew [*Oidium heveae*: see preceding abstract] conference, the Rubber Experiment Station and the Besoeki Experiment Station (Java) have organized a joint course of instruction for the estimation of various grades of normal leaf fall and mildew infection in field and estate surveys. Four classes of mildew attack are differentiated, viz., (*a*) those in which the trees have only a few spots on the leaves and suffer no apparent injury from the disease; (*b*) slightly diseased trees, showing spots and occasional malformation of the leaves but no appreciable defoliation; (*c*) severely infected trees, displaying pronounced malformation and extensive loss of foliage; and (*d*) very heavily infected trees, characterized by virtually complete defoliation. Brief directions are given for distinguishing mildew injury from that caused by insects or wind.

Van Dillen (L. R.). **Een methode om zwavel geschikter te maken voor verstuivings doeleinden.** [A method of rendering sulphur more adaptable for dusting purposes.]—*De Bergcultures*, iii, 56, pp. 1430–1431, 1929.

While engaged on experiments at Besoeki (Java) in the improvement of the sulphur (containing 0·70 per cent. water, 1·84 per cent. ash, 0·48 per cent. organic material, and 2·6 per cent. acid) used against rubber mildew [*Oidium heveae*: see preceding abstracts]

by a reduction of the acid content, the writer received a sample of sulphur specially prepared for dusting by an American firm. The price of this material being about twice as high as that of the local product, it is unlikely to find a wide use in the Dutch East Indies. It was found that when the local sulphur was mixed with 10 per cent. slaked lime in order to prevent the coagulation of the particles, as is the practice with dusting sulphurs in the United States, excellent results were obtained and all difficulty in the distribution of the sulphur was obviated.

Zwavelverstuivingsapparaat Platz. [The Platz sulphur dusting apparatus.]—*De Bergcultures*, iii, 53, p. 1349, 1 fig., 1929.

Arrangements have been made for the trial, by various Java rubber companies, of the motor sulphur dusting apparatus supplied by C. Platz, Ludwigshafen-am-Rhein [for use against rubber mildew (*Oidium heveae*) : see preceding abstracts]. The apparatus, which costs Fl. 500 direct from the factory (Fl. 625 to 650 in Java), is stated to be convenient and easily transportable. It is furnished with a separate fan for cooling the motor and an adjustment for the regulation of the quantity of sulphur.

De Vries (O.). **Zwavelverstuivingsapparaat 'Sulfia' van de firma Holder.** [Sulphur dusting apparatus Sulfia from the firm of Holder.]—*De Bergcultures*, iii, 57, pp. 1450–1451, 2 figs., 1929.

A few details are given concerning the construction and use of the Sulfia motor apparatus (Maschinenfabrik Gebr. Holder, Metzingen, Württemberg) for the application of sulphur dust against rubber mildew [*Oidium heveae*: see preceding abstracts]. The cost of the machine, which is stated to have given satisfactory results, is Fl. 500 (Fl. 650 in Java) ; it can be worked by three men.

Mitchell (J.). **Notes on brown bast treatment.**—*Second Quart. Circ. for 1929, Rubber Res. Scheme (Ceylon)*, p. 4, 1 pl., 1929.

In connexion with the combined scraping and isolation method advocated for the control of brown bast of *Hevea* rubber in Ceylon [*R.A.M.*, vii, p. 468] the author states that evidence has recently been obtained which indicates that the renewed bark is no more susceptible to the disease than is normal bark. One tree so dealt with has been tapped for over two years on the third-day system and continues to give satisfactory yields, without showing any sign of brown bast. Many other trees on the same estate, which were scraped in 1927, are being successfully tapped and it is anticipated that more than one thousand treated trees will be in bearing during 1930.

Swift (Marjorie E.). **Contributions to a mycological flora of local soils.**—*Mycologia*, xxi, 4, pp. 204–221, 4 pl., 1929.

This is a brief account of an investigation, at Evanston, Illinois, in 1927–8, into the fungal flora of local soils, twenty-two types of

which were examined, ranging from pure sand from the shore of Lake Michigan to forest humus. The samples were taken from cultivated and uncultivated areas, at the surface and at depths varying from 5 to 120 cm. They yielded a total of 39 species and one variety of fungi, belonging to eighteen genera, the cultural characters of which on Blakeslee's malt extract agar are briefly described. In this number are included two new species, namely, *Chaetomium subterraneum* and *Trichurus terrophilus*, English diagnoses of which are given. In addition, four species of *Actinomyces* were observed.

The results of this investigation confirmed the conclusions of previous workers as to the genera that are most commonly found in the soil, namely, *Aspergillus*, *Fusarium*, *Mucor*, *Penicillium*, *Rhizopus*, *Trichoderma*, and *Zygorrhynchus* [*R.A.M.*, vii, p. 740; viii, p. 335]. Surface soil contained the largest number of fungi, which were less numerous with increasing depth. Species of *Mucor*, *Aspergillus*, and *Penicillium* were predominant at the surface. *T. koningi*, *Z. vuilleminii*, and species of *Penicillium* appeared in sub-surface soil more frequently than other forms, and with the addition of *C. subterraneum* and *Verticillium lateritium*, were found at depths ranging from 90 to 120 cm. In cultivated areas species of *Mucor* were dominant, but they occurred only sparsely in untilled soils.

Norris (R. V.), Subrahmanyan (V.), & Ganesha Rao (M.). **Soil Actinomyces.**—*Agric. Journ. India*, xxiv, 4, pp. 232–234, 1929.

The authors state that their recent investigations tend to show that species of *Actinomyces* seldom, if ever, occur vegetatively in normal soil, but are present in them in the form of conidia. This fact was confirmed by the examination of a number of samples of soil from different parts of India and Ceylon, in which the number of *Actinomyces* spores varied from practically nil to about four millions per gramme of soil. No correlation was found to exist between the number of spores and climatic conditions, rainfall, or physical texture of the soil, although it was noticed that garden and sodden soils generally carried larger numbers than intensively cultivated arable soils. This observation, taken in conjunction with the fact established by previous workers that species of *Actinomyces* can readily attack cellulose, is believed to indicate that their growth and activity in the soil are greatly favoured by the presence of plant residues combined with surface shade. No relationship was found between the number of spores and the known fertility of the soil, as shown by the counts obtained for certain representative types of soil [which are given in tabular form].

A brief description is given of a plating method devised by the authors for counting the spores present in the soil, and also of a starch agar medium, containing a very small amount of nitrogen, which is stated to be best suited for bringing out the largest numbers of the different strains of *Actinomyces*, while discouraging the development of other micro-organisms.

Millasseau (J.). **Contribution à l'étude morphologique du Peronoplasmopara humuli Miya. et Tak.** [Contribution to the morphological study of *Peronoplasmopara humuli* Miya. & Tak.]—*Ann. des Épiphyties*, xiv, 3, pp. 177–198, 22 figs., 1929.

In giving a brief account of his morphological study of the downy mildew of hops (*Peronoplasmopara* [*Pseudoperonospora*] *humuli*) in France (for which he considers the name *Peronoplasmopara humuli* has priority) [cf. *R.A.M.*, vi, p. 119], the author states that for the most part it confirmed the descriptions of the fungus given by Miyabe and Takahashi [whose diagnosis is reproduced in French], Salmon and Ware [ibid., iv, p. 702], and Blattný [ibid., vi, p. 690]; it also confirmed the occurrence of perennating mycelium on the underground organs of the host. His cytological investigation of the infected aerial organs of the hop showed that, after penetration into the shoots, the mycelium spreads circularly under the subepidermal layer of cells, where it may in time form large agglomerations. Further penetration in depth is effected between the bundles of the pericyclic fibres; in the phloem the mycelium forms a large number of haustoria which penetrate the cell walls. The fungus then progresses through the cambium and enters the wood preferably through the medullary rays. In the pith, the mycelium forms bundles which at first attack only a small number of cells, the walls of which are swollen to five or six times the normal thickness, probably owing to biochemical changes in the constituents of the membranes. Occasionally there is also a marked hyperplasy of the pith cells, and also of the cortical cells, a fact which tends to explain the grouping of the mycelium into strands in the pith, as the surrounding meristematic zone forms a barrier to the lateral spread of the hyphae.

Some morphological and cytological details are also given of the various spore forms of the fungus, and the haustoria are fully described.

Arens (K.). **Untersuchungen über Pseudoperonospora humuli (Miyabe u. Takah.), den Erreger der neuen Hopfenkrankheit.** [Investigations on *Pseudoperonospora humuli* (Miyabe & Takah.), the causal organism of the new Hop disease.]—*Phytopath. Zeitschr.*, i, 2, pp. 169–193, 29 figs., 1929.

The work of contemporary investigators on the downy mildew of hops (*Pseudoperonospora humuli*) [see preceding abstract] is summarized, and the author's researches on the life-history of the fungus described.

After the penetration of the leaf tissue by the germ-tube of a zoospore, infection is limited in dry weather to a few intercostal areas (so-called 'mosaic spots'), as in the case of vine downy mildew (*Plasmopara viticola*) [*R.A.M.*, viii, pp. 482, 483]. Young leaves are liable to much heavier infection than older ones. The air chambers below the stomata are densely filled with mycelium, which emerges through the stomata to form conidiophores. The mycelium develops just as easily in the embryonic tissue of the

shoot tips as in the leaves, and also extends through the pith, which is increased and may fill the interior of the stem.

The great majority of the oospores [which are fully described] occur in the leaves (up to 160 per sq. mm.). They have been found as early as the middle of June (in 1927), but are mostly formed in the mosaic-like lesions of late autumn infections, when weather conditions do not favour the development of the vegetative stage [cf. ibid., viii, p. 150].

The height of the conidiophores fluctuates between 100 and 450 μ according to temperature and atmospheric humidity. The minimum temperature for the development of these organs was found to be 5° to 6° C., with an optimum at or below 20° and a maximum round about 30°. The optimum degree of relative atmospheric humidity was found to be about 95 to 100 per cent. (minimum 90 per cent.). The length of the incubation period is influenced by temperature and atmospheric humidity, being about 6 days at a temperature of 20° to 22° with high moisture, but protracted in dry weather and at temperatures below 6° to 7°. The conidiophores cannot develop in full daylight, but they are able to grow in the subdued light of a room at a distance from the window. In the open, however, emergence always takes place at night.

A proportion of the conidia kept in a room with an atmospheric humidity range of 60 to 95 per cent. were still viable after 29 days, and they were not killed by freezing in water. The conidia of *Pseudoperonospora humuli* can germinate at lower temperatures than those of *Plasmopara viticola* (6°) and are apparently less sensitive than the latter to the action of dissolved substances. The optimum germination temperature is 18° to 20°, with a maximum below 28°.

The duration of activity of the zoospores depends on temperature, lasting over 24 hours at 4° to 7°, 2 to 6 hours at 20° to 22°, and only 25 minutes at 30°. Their germination begins within 15 minutes after the cessation of motility at 20°, but not for several hours at 4°. At temperatures round about 20°, wet leaves may become infected in 15 to 20 minutes. The majority of infections occur at the serrate leaf margins, the angles between the larger veins, and along the midribs.

The occurrence of healthy shoots in immediate proximity to diseased ones does not support the theory of the overwintering of the mycelium in the stock. The examination of 46 diseased shoots revealed the presence of mycelium in 39. In no case, however, did the hyphae reach the point of insertion of the shoots on the root-stock. Moreover, the mycelium was never observed to proceed from the rhizome into the shoot or vice versa, infection apparently taking place above soil level. The brown, discoloured mycelium in the stock was found to be dead, while the hyphae in the tissues of a spring shoot were normal. The infection of young shoots, therefore, must take place externally, probably through the stomata at or near soil level, which are entered by zoospores produced by overwintered oospores. These bodies were found to germinate in 6 days at 20° to 22°, and produced sporangia that were much larger than the summer ones (50 : 31), the zoospores numbering 40 to 60, against 5 to 12 liberated from the ordinary sporangia. The

oospores are fairly sensitive to protracted desiccation and died after four months under dry conditions in the laboratory. In the field such conditions are unlikely to prevail, and hence the viability of the oospores may persist for years.

The application of these data to the practical aspects of control is briefly discussed.

BRANDES (E. W.). **Plant quarantine practice in Sugar-Cane migrations.**—*Sugar*, xxxi, 9, pp. 343–344, 354, 4 figs., 1929.

After a brief general review of the practice of quarantine in relation to the movement of sugar-cane plants, the author, representing a committee on this subject of the International Society of Sugar Technologists, makes the following recommendations. 1. All planting material should be examined by competent plant pathologists and entomologists at points of origin or shipment and certified to be free from insect pests and disease so far as is disclosed by such examination. 2. It should be inspected upon arrival by inspectors familiar with the insect pests and diseases of sugar-cane, and all material passed for planting treated in water at 50° C. for 15 minutes, then dipped for a few seconds in 95 per cent. alcohol, and finally immersed for 5 minutes in a disinfectant, e.g., 1 in 1,000 mercuric chloride. 3. Cuttings should then be planted in sterilized soil in containers large enough to permit normal growth to full maturity. 4. The planted cuttings should then be isolated from commercial cane and from imported lots of cane of other origin for the period of growth to maturity or for a year, preferably in quarantine greenhouses screened and otherwise protected against insects. 5. The growing plants should be inspected at frequent intervals by competent plant pathologists and entomologists. Plants suspected of harbouring a disease or pest should be further isolated in a screened cage and closely observed for subsequent developments. In all cases where the disease is confirmed the plant should be burnt or otherwise rendered innocuous. 6. When the plant is released from quarantine all cuttings should be treated as described in (2) before planting in the open.

The total initial cost of providing the above-mentioned quarantine facilities is estimated at $6,600 and the annual maintenance at $2,700.

DUFRÉNOY (J.). **La mosaïque de la Canne à Sucre.** [Sugar-Cane mosaic.]—*Ann. des Épiphyties*, xiv, 3, pp. 199–210, 1 pl., 6 figs., 1929.

This is a brief account of the author's investigation, carried out during his stay in the United States, of the cytological changes that occur in the cells of sugar-cane plants affected with mosaic, which, in his opinion, may be used for a rapid diagnosis of the disease in its earliest stages [cf. *R.A.M.*, viii, pp. 518, 677]. The observations were made on the Louisiana Ribbon variety, which is susceptible, and a resistant P.O.J. variety of cane. The first symptom of mosaic is the breaking up of the large central vacuole, which is usually found in healthy cells of the leaves, into

a large number of small vacuoles; in cases where a large vacuole does develop in a cell within infected tissue, the cytoplasm of the neighbouring cells is always pitted with small vacuoles, this giving it a spongy aspect. This phenomenon, which considerably increases the contact surface between the cytoplasm and the vacuolar contents, is believed to indicate a heightened activity of the cell. In mosaic diseased cells photosynthetic activity is reduced, and the osmotic pressure of the vacuolar liquid is less than in normal green cells; further, they always contain a proteolytic focus, which may be recognized under the microscope by the fact that it is more easily stained than the rest of the cytoplasm.

Bureau of Sugar Experiment Stations.—*Queensland Agric. Journ.*, xxxii, 1, pp. 4–7, 1929.

Leaf stripe of sugar-cane (*Sclerospora sacchari*) [*R.A.M.*, viii, p. 666] is stated to be very destructive on B. 208 canes in the Lower Burdekin district of Queensland, and on B. 147 and Pompey in the Mossman area; control is recommended by suitable preventive measures [loc. cit.]. A survey of the Giru district made in April, 1929, showed that *S. sacchari* was present on five, and mosaic on seven, farms, out of a total of 71 inspected, the only variety affected being B. 208. Orders were issued to eradicate the leaf stripe canes. Small plantings of P.O.J. 2714 in this area were very susceptible to top rot [loc. cit.].

A list is given of 27 farms in the Bundaberg district which were found free from gumming disease [*Bacterium vascularum*], and are recommended as suitable sources of planting material for the district.

Henares (H.) & Aurelio (C. G.). **Cane disease and its effect on the Java ratio.**—*Internat. Sugar Journ.*, xxi, 367, pp. 357–359, 1929.

This account of an investigation into the recent drop in the Java ratio of sugar-canes in the Philippine Islands affected with pine-apple disease (*Thielaviopsis paradoxa*) has already been noticed from another source [*R.A.M.*, viii, p. 670].

Tehon (L. R.) & Stout (G. L.). **Notes on the parasitic fungi of Illinois. IV.**—*Mycologia*, xxi, 4, pp. 180–196, 1 pl., 1929.

The fourth series of notes on parasitic fungi that have been recorded in Illinois [*R.A.M.*, vi, p. 754] includes, amongst others, the following new species which are of phytopathological interest. *Stigmatophragmia sassafrasicola* n. g., n. sp., *Pseudodictya sassafrasicola* n. g., n. sp., *Diplopeltis sassafrasicola*, and *Metasphaeria sassafrasicola* on *Sassafras variifolium*; *Melanospora interna* on tomato; *Metasphaeria asparagi* and *Phoma asparagina* on asparagus; *Pleospora oleraceae* on *Brassica oleracea*; *Macrophoma phlei* on *Phleum pratense*; *Cyphellopycnis pastinacae* n. g., n. sp. on parsnip; *Diplodia acericola* on *Acer saccharum*; *Cryptostictis inaequalis* on *Vitis rotundifolia*; and *Leptothyriella liquidambaris* on *Liquidambar styraciflua*.

Notes are also given on 33 species of parasitic fungi recorded

either for the first time for Illinois, or for the first time since the early collections made about 1880 to 1890.

ABBOTT (E. V.). **Diseases of economic plants in Peru.**—*Phytopath.*, xix, 7, pp. 645–656, 1929.

Among the many interesting items in this report (the first of its kind) on the diseases of Peruvian economic plants identified by the writer since 1927, the following may be mentioned. Red rot of sugar-cane (*Colletotrichum falcatum*) is prevalent in the coastal valleys but seldom of great importance, and the same applies, generally speaking, to eye spot (*Helminthosporium ocellum*) [*R.A.M.*, viii, p. 135]; the latter, however, may cause severe infection of Bourbon cane. Rind rot (*Melanconium sacchari*) [ibid., vii, p. 734] and sheath disease (*Chaetomella sacchari*) are also of widespread occurrence, the former chiefly as a sequel to damage by stalk borers.

Leaf, bract, and boll spot of cotton (*Helminthosporium gossypii*) is widely distributed but causes little injury. Mildew (*Ovulariopsis gossypii*) [ibid., vii, pp. 139, 618] has also been observed. Cotton in moist soils may suffer severely from the attacks of this fungus, which causes leaf curl and premature defoliation.

The most important disease of maize in Peru is thought to be leaf spot caused by *Cercospora sorghi*, which leads to a premature drying of the leaves.

Potato wart (*Synchytrium endobioticum*) is known to occur in the central Andes near Jauja.

One of the chief diseases of coffee in the 'montana' (the region lying east of the Andes and comprising the valleys of the headwater rivers of the Amazon) is eye spot (*Stilbella* [*Omphalia*] *flavida*) [ibid., viii, p. 442]. Zonal leaf spot (*Cephalosporium* sp.) occurs in a mild form in certain sections of the coffee districts. Of considerable importance is the root disease of coffee (*Rosellinia ? bunodes*) [loc. cit.].

The chief disease of avocado is anthracnose (*Physalospora perseae* Doidge) [ibid., iii, p. 92], which is gradually spreading in the Santa Eulalia district, one of the principal sources of the Lima supply. Scab (*Sporotrichum citri*) [ibid., v, p. 310] is also prevalent on avocados in the Lima market.

Limes in southern Peru are subject to infection by *Sphaeropsis tumefaciens*. Dry root rot (*Fusarium* sp.) occurs on oranges in the central section.

Anthracnose of bananas (*Gloeosporium musarum*) and also the rot caused by *Rhizopus nigricans* [ibid., vi, p. 145] are common on market fruit. Leaf spot (*Cercospora musarum*) [*Helminthosporium torulosum*: ibid., viii, p. 632] is widely distributed in a mild form.

Tomato mosaic occurs in the coastal districts.

MITRA (M.). **Some diseases of crops in the Andaman Islands.**—*Agric. Res. Inst., Pusa, Bull.* 195, 14 pp., 1929.

In February, 1927, the writer visited the Andaman Islands to make a survey of the diseases affecting the various crops. The present paper contains observations on these diseases and directions

for their control. Root disease of coco-nuts (*Botryodiplodia* sp.) [*R.A.M.*, iv, p. 668] causes little damage in the few localities where it occurs. Stem bleeding (*Thielaviopsis paradoxa*) [ibid., viii, p. 564] has only been found in six cases, and the infected trees were burnt. Nut fall is caused by a species of *Phytophthora* closely related to, if not identical with that occurring in Malabar [*P. arecae*: ibid., iv, p. 165] and Ceylon [ibid., iii, p. 516; vi, p. 609]. Both young and mature nuts are affected. The fallen nuts are dark or blackish-brown at the base or point of attachment, the husk and kernel are soft and rotten, and the kernel and milk are malodorous and unfit for consumption. The axis of the inflorescence turns dark brown and rots, so that all the nuts on a diseased inflorescence fall off. Burning the diseased material and spraying with Bordeaux mixture just before the rain sets in and again during a spell of fine weather are recommended. A leaf spot caused by *Pestalozzia palmarum* [ibid., viii, p. 170] is very common, while the foliage is also attacked by *Exosporium palmivorum*, producing leaf spots bearing small black tubercles, and by a species of *Mycosphaerella*.

Three leaf spots of *Hevea* rubber were observed, viz., *Helminthosporium heveae* [ibid., vii, p. 308]; rim blight (*Sphaerella* [*Mycosphaerella*] *heveae*), producing numerous yellowish, later purple or purplish-brown, and finally grey spots, densely clustered in groups between the veins, the fructifications appearing as minute black points on the margins of the spots; and *Colletotrichum heveae*, causing the development of irregular, dry, greyish-brown spots. The damage caused by these organisms is inconsiderable. *B. theobromae* is responsible for a root rot of rubber seedlings and for a die-back involving both young and older plants [ibid., vii, p. 224]. Notes are also given on pink disease (*Corticium salmonicolor*) and on black thread (*Phytophthora meadii*) and canker (*Phytophthora* sp.) of rubber. The causal organisms of the two last-named diseases were not isolated, so that their identification is doubtful.

Jack fruit [*Artocarpus integrifolia*] was attacked by *Rhizopus artocarpi*; mangosteen [*Garcinia mangostana*] by a die-back of undetermined origin; tomatoes by a wilt disease probably due to *Fusarium lycopersici*; and bananas also by wilt possibly caused by *Fusarium*. Up to 90 per cent. of the lime and orange trees in the settlement were found to be seriously affected by anthracnose or wither-tip (*Colletotrichum gloeosporioides*), also known locally as 'die-back'; sooty mould (*Meliola butleri*) has also been observed on the leaves and fruits in a mild form.

Notes are given on a number of other common diseases of tropical crops, with directions for the preparation of Bordeaux and Burgundy mixtures.

Shaw (H. B.). **Sugar-Cane import restrictions. A summary of regulations in various countries regarding introductions of foreign Canes.**—*Facts about Sugar*, xxiv, 39, pp. 929, 931, 1929.

A brief summary is given of the regulations governing the importation of sugar-cane into various countries with a view to the exclusion of insect pests and fungous diseases.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

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GILMAN (J. C.) & ARCHER (W. A.). **The fungi of Iowa parasitic on plants.**—*Iowa State Coll. Journ. of Sci.*, iii, 4, pp. 299–507, 1929.

This alphabetical list of 938 diseases (of which 885 are due to fungal parasites, 31 to bacteria, and 22 are of physiological origin) on 1,019 host plants of Iowa is based on a critical examination of herbarium material and on a field survey conducted by the junior author in 1927. A host index and a bibliography of 540 titles are appended.

HERSPERGER (C.). **Ueber das Vorkommen einer Aecidienperidie bei Melampsoren.** [On the occurrence of an aecidial peridium in Melampsoraceae.]—*Mitt. Naturforsch. Gesellsch. Bern, 1928*, p. xxvii, 1 fig., 1929.

Cross-inoculations established the genetic connexion between a *Melampsora* on *Populus trichocarpa* and aecidia on *Larix decidua* in the Berne Botanic Garden. The fungus agreed with *M. larici-populina*, except that typical peridia were found in the aecidiosori. A re-examination of Fischer's material from his inoculations of 1896 and of a collection by Mayor in 1928 showed that similar peridia occur in the aecidia of *M. larici-populina*, with which the author's fungus is, therefore, identified. It is thus evident that the common statement that the aecidial stage of *Melampsora* is of the *Caeoma* type requires modification.

SHEAR (C. L.). **The life-history of Sphaceloma ampelinum de Bary.**—*Phytopath.*, xix, 7, pp. 673–679, 5 figs., 1929.

The fungus commonly known as *Sphaceloma ampelinum* or *Gloeosporium ampelophagum* [*R.A.M.*, viii, p. 109] is the cause of vine anthracnose in the eastern United States and Europe. Viala and Pacottet described it in 1904 and 1905 as producing two or three conidial stages (including pycnidia) and an ascosporal yeast form. They named it *Manginia ampelina*.

The writer found that the conidia bud readily in culture, producing forms resembling the yeasts described in the French papers,

while bodies corresponding to the cysts were also found in the mycelium: the other forms of fructification, however, were not detected. A study of closely allied organisms, e.g., *G. venetum* and the citrus scab fungus [*Sphaceloma* or *Sporotrichum citri*], leads the writer to suspect that Viala's and Pacottet's cultures were impure.

The marked similarity between cultures of the raspberry anthracnose fungus (*G. venetum*) and those of the grape anthracnose fungus suggests that the two are generically identical. A quantity of severely cankered vine stems were obtained from Norfolk, Virginia, and kept out-of-doors over winter at Washington. In the spring the old cankers were found to bear ascocarps very closely resembling those described in *Plectodiscella veneta*, the perfect stage of *G. venetum*. Later some of the ascocarps showed nearly mature asci and hyaline, triseptate ascospores measuring 15 to 16 by 4 to 4·5 μ. Single ascospore cultures could not be obtained from this material, and therefore the evidence of a genetic connexion between *G. ampelophagum* and the ascocarps in the cankers is at present merely circumstantial. It is difficult to separate the grape and the raspberry anthracnose organisms on cultural or morphological grounds in either the conidial or the ascogenous stage, but Dr. Anna E. Jenkins has shown by (unpublished) inoculation experiments that they are at least physiologically distinct, the raspberry fungus being unable to infect the grape.

The ascocarps of the grape anthracnose fungus consist chiefly of pseudoparenchymatous tissue in which the asci, containing hyaline, 3-septate ascospores, 15 to 16 by 4 to 4·5 μ, are irregularly embedded. The genus *Plectodiscella* described by Woronichin (*Mycol. Centralbl.*, iv, p. 225, 1914) is based on *P. pyri* [ibid., viii, p. 469], the cause of a leaf spot of apple and pear in the Caucasus. It has a very similar ascocarp to that of the grape fungus, but more regular in outline, and with a definite dark-coloured outer covering. The genus *Elsinoe*, the type species of which is *E. canavalliae* Rac. 1900, evidently closely resembles *P. veneta* and the grape organism, and the author considers that on the basis of priority the generic name of the apple, *Rubus*, and grape fungi should be *Elsinoe*. The ascogenous stage found on the grape is referred to this genus as *E. ampelina*. Raciborski described a species of *Elsinoe* on *Vitis* leaves in Java as *E. viticola*, and it is possible that this organism, which agrees closely with the grape fungus, is a synonym of *E. ampelina* (de Bary) Shear, n.comb.

CORNER (E. J. H.). **A Humariaceous fungus parasitic on a Liverwort.**—*Ann. of Botany*, xliii, 171, pp. 491–505, 6 figs., 1929.

A diagnosis in English and a full description is given of *Neotiella crozalsiana* Grelet (*Bull. Soc. Myc. de France*, xli, p. 83, 1925), which was found in the Chilterns developing as an ectoparasite on the liverwort *Plagiochila asplenioides*, to which it causes relatively little injury. The fungus is chiefly characterized by special haustorial branches and an apothecium similar in structure and mechanism to a perithecium. The haustoria arise from a superficial mycelium and consist of a stalk, a central body, and several

hyphal processes. The stalk is less than 1 μ wide, and connects the central ovoid body with the appressorium through a rigid tube, 10 to 14 by 2 to 3 μ, which is continuous with the wall of the host cell. Occasionally, the stalk may have a distinct hyphal wall of its own, and the tube may be very thin or even absent. The central body is more or less at right angles to the stalk, and from its distal end one or two unbranched hyphal processes up to 2 μ wide arise and coil around in the host cell. The haustorium has one to three nuclei in the central body, and one or two in the hyphal processes. The way in which the haustorium penetrates the host cell could not be determined.

A discussion is given of the systematic position of the fungus.

HAIGH (J. C.). **Macrophomina phaseoli (Maubl.) Ashby and Rhizoctonia bataticola (Taub.) Butl.**—*Trop. Agriculturist*, lxxiii, 1, pp. 3–4, 1929.

In this preliminary report on his continued study of *Rhizoctonia bataticola* (*Macrophomina phaseoli*) [*R.A.M.*, vii, p. 540], the author states that the strains of this fungus isolated from different hosts may be separated, on the basis of the mean diameter of the sclerotia in culture, into three groups, namely, one with a mean sclerotial diameter of up to 120 μ, a second with a mean diameter of round about 200 μ, and a third group containing the strains whose sclerotia are commonly measured in millimetres. He also points out that, so far as he is aware, pycnospores of *M. phaseoli*, from whatever source they have been isolated in Ceylon, have always produced in culture sclerotia belonging to the first group. It is, therefore, by no means certain that all the sclerotial forms now included in *R. bataticola* will have *M. phaseoli* as their perfect stage, and he suggests that it is safer to refer to the sclerotial forms as *R. bataticola* and to reserve the binomial *M. phaseoli* for the pycnidial stage.

DUFRÉNOY (J.). **Les hadromycoses des États de l'Est des États-Unis.** [Hadromycoses in the eastern States of the United States.]—*Ann. Cryptogamie Exot.*, ii, 2, pp. 158–167, 1 fig., 1929.

As a result of his study, during a visit to the United States, of the distribution of the fungal diseases of woody and herbaceous plants which may be grouped together as 'hadromycoses' [*R.A.M.*, vii, p. 179], the author states that the eastern seaboard of North America from Canada to Florida may be divided into three regions, namely, (1) northern belt, where these diseases are chiefly caused by species of *Verticillium*; (2) cotton belt, where species of *Fusarium* are prevalent; and (3) South Florida, where species of *Phomopsis* are chiefly responsible. In Europe, species of *Verticillium* are chiefly known to occur in Holland, England, and in the valleys of France and Italy. The evidence thus collected would seem to indicate that the geographical distribution of the fungi involved in hadromycoses depends on their temperature relations.

TUNSTALL (A. C.). **Vegetable parasites of the Tea plant (continued). Blights on the root.**—*Quart. Journ. Indian Tea Assoc., 1929*, 2, pp. 68–75, 1929.

Continuing his survey of the vegetable parasites of the tea plant [*R.A.M.*, viii, p. 611], the author gives notes on the symptoms, effects, life-history, and control of internal root rot (*Botryodiplodia theobromae*) [*R.A.M.*, viii, p. 677]. The perfect stage, *Thyridaria tarda*, has been observed on four occasions in the Doom Dooma district and the Surma Valley, and immature pycnidia typical of *B. theobromae* were obtained in culture from ascospores of two of these. The perithecia occur on the stem or exposed roots, and are immersed except for the ostiole. The asci are cylindrico-clavate, 115 to 150 by 18 to 26·5 μ, sessile or short-stalked, containing 8 irregularly arranged ascospores which are oblong, triseptate, slightly constricted at the septa, brown, and 26 to 28·5 by 6·4 to 9 μ in diameter. Paraphyses are present. Affected bushes may die quite suddenly, with all their leaves attached, as though struck by lightning, or they may gradually wither branch by branch. The yellow mottling of the foliage, described by Petch, is a common symptom of debility in the districts concerned, but is not necessarily associated with internal root rot.

No such correlation as that observed by Gadd [loc. cit.] between the presence of *B. theobromae* and the absence of starch in the roots has been found by the writer. In many cases severely diseased roots and stems were found to contain plentiful reserves of starch. Roots killed by *B. theobromae* appear quite normal externally, but on exposure the wood is often found to be streaked with grey.

Of the 196,224 seeds examined during the last five years, only 133 were found to be infected by *B. theobromae*, showing that the seed is not likely to be a serious source of infection.

The internal root disease is most prevalent on young bushes in coarse, sandy soils with an acid reaction, but it may also occur on stiff neutral soils. Most of the bushes heavily manured with phosphates at Borbhetta were badly attacked, while later observations showed that increased susceptibility also results from a deficiency of phosphates. In the former case the bushes recovered with the application of liberal doses of potash. Probably any factor contributing to loss of vigour, e.g., prolonged drought or waterlogging, favours the development of the fungus. Collar-pruned plants seem particularly liable to attack. The best way to combat infection by *B. theobromae* is to destroy all dead bushes and to apply a mixture of potash, phosphoric acid, and nitrogen to sickly ones, which should also be given a partial or complete rest from plucking. Spraying with a standard fungicide, e.g., lime-sulphur, may reduce the amount of infection and strengthen the stems and green shoots.

U.P.A.S.I. Tea Specialist's Reports. The control of root diseases of the Tea plant.—*Planters' Chron.*, xxiv, 27, pp. 574–578; 28, pp. 601–608, 1929.

This is a general discussion, written in popular language, of the chief soil conditions that favour the occurrence of fungi responsible

for root diseases of tea (e.g., *Rosellinia* and *Poria* spp.), and of the measures best adapted for their control. The contributory factors are examined under the headings: effect of soil acidity, of shade, of drainage, and of temporary abandonment of tea on infected areas. In discussing soil disinfection, the various disadvantages of using lime are dealt with in some detail; it is believed that it may be usefully replaced by applications of ferrous sulphate, which has the advantage of possessing definite fungicidal properties, of being easily soluble in water, of being neutral and with no detrimental effect on the growth of tea, and of being comparatively inexpensive. The paper terminates with a consideration of ameliorative measures that should follow soil disinfection, of methods for replanting treated areas with tea, and finally a summary is given of the control measures recommended.

BRYAN (MARY K.). **A fruit spot of Tomato caused by Aplanobacter michiganense.**—*Phytopath.*, xix, 7, p. 690, 1929.

A characteristic fruit spot of tomato, found in Georgia and Mississippi, in fields where bacterial canker was present, has been shown to represent another phase of this disease caused by *Aplanobacter michiganense* [*R.A.M.*, vii, p. 680]. The spots are unlike those produced by *Bacterium vesicatorium* [ibid., ix, pp. 18, 37], being round, never dendritic, white (later developing a lenticular rift or a round, light brown, roughened centre surrounded by a white halo), not water-soaked, eventually fusing into large, roughened patches, and in advanced stages dark brown, while often retaining the white halo. *A. michiganense* has repeatedly been isolated from natural infections, inoculated into healthy fruit with positive results, and reisolated. Moreover, typical systemic infection has been produced with fruit spot isolations and vice versa.

WILLIAMS (P. H.). **Fungi occurring in Tomato roots.**—*Fourteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1928*, pp. 42–45, 1929.

Colletotrichum atramentarium has been found commonly present in the roots of apparently healthy tomato plants [*R.A.M.*, vi, p. 61], while in other cases the roots are diseased without showing any of the typical sclerotia of the fungus. Isolations made from roots affected both by cortical rot and corky scab yielded *Fusarium culmorum*, *F.* spp. (A characterized by cream-coloured tufted growth, and B and C by white, fluffy growth on hard potato agar, the last-named also producing a blue coloration of the medium), *Phytophthora* sp., *C. atramentarium*, *Trichoderma koningi*, several strains of a sterile fungus with a white to grey mycelium, forming a hard, stroma-like mass of carbonaceous hyphae on certain media, and various types of bacteria. *F. culmorum* attacked the wood and pith of inoculated tomato plants and in one case also caused carnation wilt [ibid., ix, p. 37]; *F.* sp. A infected the pith, while B and C, the sterile fungus, and three bacteria produced collapse, *T. koningi* slight browning of pith, and *C. atramentarium* was also pathogenic.

Schoevers (T. A. C.). **De overgang van den Tomatenkanker met het zaad.** [The transmission of Tomato canker with the seed.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 56, pp. 12–15, 1 pl., 1929.

At the end of 1928 the writer tested tomato seed which had given a diseased crop in Zeeland. A portion of the seed was disinfected with uspulun dust [tillantin R] and the remainder left untreated, some from both lots being placed on damp filter paper and the rest in boxes of clean sand for germination. The seedlings developing from the treated seed were healthy, while those from the untreated were either completely rotted or showed brown, decayed spots on the stems immediately below the cotyledons. Numerous pycnidia of the tomato canker fungus (*Didymella lycopersici*) [*R.A.M.*, ix, p. 16] developed on the brown spots and also on the hairy seed-coats.

A number of seeds from the diseased lot were placed in damp Petri dishes, and after a day or two the mycelium of the fungus grew out. Pycnidia were formed both in the submerged mycelium and in that on the hairs of the seed-coat.

The transmission of tomato canker by means of the seed, probably on its surface, is thus definitely established.

Williams (P. H.). **Investigations on the control of Verticillium wilt of the Tomato.**—*Fourteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1928*, pp. 36–38, 1929.

The results of further experiments in the control of tomato wilt (*Verticillium*) [*albo-atrum*: *R.A.M.*, viii, p. 751] are summarized and tabulated. Six-weeks-old plants in 32 pots were inoculated with the fungus, and a fortnight later various chemical compounds were applied to the roots either in solution or in solid form. The most promising of these was a mixture of mercuric chloride and sodium nitrate.

McWhorter (F. P.) & Parker (M. M.). **Fusarium wilt of Tomato in Virginia.**—*Virginia Truck Exper. Stat. Bull.* 64, pp. 661–674, 2 charts, 1928. [Received September, 1929.]

A brief account is given in popular terms of the symptoms and life-history of tomato wilt (*Fusarium lycopersici*), which is stated to cause extensive losses in Virginia. The results of field experiments [which are described and tabulated], carried out in eight widely separated localities of the Northern Neck region, showed that both the Marglobe and Invincible varieties are superior to Stone in resistance to wilt [*R.A.M.*, vii, p. 811 *et passim*]. At least three distinct strain groups of the fungus occur in Virginia, of which two are decidedly more pathogenic to the commercial tomato varieties than the third. Some cultural measures for the control of the disease are indicated.

Small (T.). **Tomato 'mildew' or leaf-mould.**—*Fourteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1928*, pp. 45–62, 1929.

Continuing his investigations on leaf mould of tomatoes (*Cladosporium fulvum*) [*R.A.M.*, vii, p. 750], the writer found that the

severity of the disease is closely correlated with atmospheric temperature and humidity [ibid., viii, p. 757]. The effect of early environmental conditions persists after primary infection is initiated and largely determines the amount of mildew which develops. The optimum temperature for the various stages of mildew is about 72° F. Under humid conditions severe primary infection occurs at 50° to 55°, but subsequent development is very slow below 60°. Leaf mould is favoured by the temperatures usually prevailing in tomato glasshouses, which further encourage the production of soft, turgid, and highly susceptible plants. Under optimum temperature conditions for leaf mould development primary infection is severe at 80 per cent. humidity but rare at 70 per cent., while at 66° both primary infection and the subsequent course of the disease are considerably retarded. In summer the persistence of damp conditions for four hours each night is liable to cause heavy infection by *C. fulvum*. Drastic ventilation during the day has not been found to counteract the injurious effects of humid nocturnal conditions.

The wetting of the foliage caused by overhead watering has not been found to increase the development of leaf mould, and it is believed that a film of water on the leaves is not essential to spore germination and infection.

The hybrids of crosses between a susceptible prolific variety, E.S.1, and two resistant but poor cropping varieties, Sterling Castle and Up-to Date, were found to combine resistance with good yielding capacity.

The spores of *C. fulvum* were found to be capable of overwintering on diseased plant tissue. They were killed by a 1 per cent. dilution of cresylic acid emulsion. Some suggestions are made for the control of leaf mould by suitable cultural practices in relation to temperature, humidity, ventilation, watering, and air movement [cf. ibid., viii, p. 534].

Spaulding (P.). **Relation of pathology to forestry in the north-east.**—*Canadian Woodlands Rev.*, i, 3, pp. 7–8, 18, 3 figs., 1929.

A general account is given in popular terms of the importance of wood-destroying fungi in the forests of the north-eastern United States, accompanied by some well-known examples of the damage caused to commercial plantings by various diseases, e. g., blister rust [*Cronartium ribicola*] of white, lodgepole, and western yellow pines [*Pinus strobus*, *P. contorta*, and *P. ponderosa*], chestnut blight [*Endothia parasitica*], and larch canker [*Dasyscypha calycina*]. Reference is made to the value of quarantine regulations in preventing the entry of dangerous parasites into the United States, and in conclusion suggestions are offered regarding the practice of slash disposal and the study of pathological rotation.

Nisikado (Y.) & Matsumoto (H.). **Preliminary note on the studies of black spot disease on Ulmus.**—*Agric. & Hort.*, iv, pp. 655–662, 8 figs., 1929. [Japanese. Abs. in *Japanese Journ. of Botany*, iv, 4, pp. (96)–(97), 1929.]

A disease of elms (*Ulmus parviflora*, *U. japonica*, and *U. pumila*),

prevalent in Japan, China, and Manchuria. is characterized by the development of yellowish spots, with black, stroma-like bodies in the centre, on the leaves in early spring and later, causing defoliation in severe cases. The causal organism was long believed to be *Melasmia ulmicifolia* B. & C. or *Systremma ulmi* (Schleich.) Theiss. & Sydow, but a critical examination has convinced the writers that it is a new species of *Gnomonia*, which is named *G. oharana* Nisikado & Matsumoto, allied to but distinct from *G. ulmea*.

Apostolides (C. A.). **A leaf spot of Sycamore caused by Stigmina platani (Fuckel) Sacc.**—*Phytopath.*, xix, 7, pp. 667–671, 2 figs., 1929.

In the autumn of 1926 the writer examined some California sycamore (*Platanus racemosa*) leaves from Pasadena affected by a leaf spot. The lower surfaces showed scattered spots 1 to 3 mm. in diameter or in severe cases were entirely black, while the upper ones bore extensive brown areas. In milder cases a light to dark brown discoloration appeared on both surfaces. *Stigmina platani*, the causal organism of a similar disease of *P. orientalis* (*Bot. Zeit.*, xxix, p. 27, 1871), was isolated from infected leaves, grown on various media (of which Czapek's agar was the most suitable), and inoculated into healthy sycamore leaves with positive results. An abundant growth of intracellular mycelium developed in the infected tissues, from which developed tufted conidiophores with one- to three-septate, ovoid to elongated, olive-green, terminal conidia, measuring 15 by 8·9 μ.

Dufrénoy [J.]. **La maladie du Châtaignier.** [The Chestnut disease.]—Limoges, Imprimerie Commerciale Perrette, 7 pp., 1 fig., 1929.

Details are given concerning the author's researches on the etiology and control of the ink disease of chestnuts (*Blepharospora* [*Phytophthora*] *cambivora*) at the Brive (Limousin) Phytopathological Station [*R.A.M.*, vii, p. 751]. The following Japanese varieties, which have already given promising results, are undergoing further tests for resistance to ink disease: *Castanea* sp. var. *coreiensis* and *C. crenata* vars. Shiba, Tamba, and Gane [ibid., vii, p. 549]. At the experimental plantation at Corrèze none of these has as yet been attacked, while the local varieties showed fresh infections from the beginning and *P. cambivora* has been isolated from them. At Migoule 50 local and 50 Japanese 2-year-old chestnuts were planted in 1924, six of each being inoculated in 1926 with the parasite. By 1927 the six local inoculated seedlings were dead and their neighbours infected, while none of the Japanese showed any marked symptoms.

Muskett (A. E.). **Control of diseases and weeds in a forest nursery.**—*Nature*, cxxiv, 3126, pp. 481–482, 1929.

Since 1920 Sitka spruce (*Picea sitchensis*) and Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] have suffered considerable damage, at the Northern Ireland Ministry of Agriculture's forest nursery, Baronscourt, Co. Tyrone, from the attacks of *Corticium*

solani and *Botrytis* sp. [cf. *R.A.M.*, vi, p. 461]. The results of an exhaustive series of experiments in the control of these organisms by various soil disinfectants showed that the most effective is sulphuric acid (1 in 80), applied on the day of sowing the seeds. Cheshunt compound [ibid., i, p. 373] was not nearly so valuable as a fungicide, though it exerted a manurial effect and stimulated development when applied to growing seedlings. Formaldehyde, mercuric chloride, and cresylic acid gave decidedly less satisfactory results than those obtained with sulphuric acid, which is now being used on a large scale in the Ministry's forest nurseries.

Darker (G. D.). **Cultures of Pucciniastrum americanum (Farlow) Arthur and P. arcticum (Lagerheim) Tranzschel.**— *Journ. Arnold Arboretum*, x, 3, pp. 156–167, 1929.

Pucciniastrum americanum and *P. arcticum*, occurring on raspberry (*Rubus idaeus* var. *strigosus*) and on *R. triflorus*, respectively, have been proved to have as alternate hosts the white spruce (*Picea canadensis*). The aecidial stages of both these rusts have apparently been designated as *Peridermium ingenuum*.

The results of cross-inoculation experiments, undertaken to establish a genetical connexion between the aecidial and teleuto stages of these organisms, are fully described and tabulated. Aecidiospores of *P. ingenuum* from spruce needles, inoculated into the leaves of *R. idaeus* var. *strigosus*, produced heavy infection after an incubation period of 7 to 11 days. The uredospores measured 17 to 22 by 9 to 14 μ, thus agreeing fairly closely with those recorded by Arthur for *Pucciniastrum americanum* (North American Flora, vii, p. 677, 1925). *R. triflorus* and *Pyrola elliptica*, inoculated simultaneously with *R. idaeus* var. *strigosus*, remained healthy. A heavy natural infection with *P. americanum* developed on leaves of *R. idaeus* var. *strigosus* near the spruce tree bearing the aecidia of *Peridermium ingenuum* earlier in the season.

Teleutospores of *Pucciniastrum americanum* from *R. idaeus* var. *strigosus* were inoculated [by a special technique which is described] into the needles of *Picea canadensis* and other conifers. After an incubation period of 9 to 14 days pycnidia appeared on the needles of *P. canadensis* only, followed a few days later by peridermia; both these bodies agreed fairly closely with the description of *Peridermium ingenuum* [loc. cit.]. The pycnospores measured 3·9 to 5·9 by 2 to 2·4 μ, the aecidiospores 20 to 28 by 17 to 21 μ, and the peridial cells 32 to 44 μ in length, 17 to 21 μ in width, and 13 to 16 μ in thickness.

Picea canadensis was further artificially infected by the teleutospores of *Pucciniastrum arcticum* from *R. triflorus*, pycnidia developing in 10 to 11 days and peridermia in 15 to 18. The pycnospores measured 3·9 to 4·7 by 1·3 to 1·6 μ, the aecidiospores 17 to 25 by 14 to 18 μ, and the peridial cells 30 to 47 by 14 to 21 μ. *R. triflorus* was successfully inoculated with the aecidiospores thus obtained on *Picea canadensis*, while *R. idaeus* var. *strigosus* remained free from infection.

The aecidial stage of *Pucciniastrum arcticum* on *Picea canadensis* is very closely related to that of *Pucciniastrum americanum*, and in fact the two species are indistinguishable in the field. Specific differences may be apparent under the microscope, but at present the name *Peridermium ingenuum* is considered to cover the aecidial stages of both species.

DAY (W. R.). **The heart rot of timber in relation to forest management.**—*Quart. Journ. of Forestry*, xxiii, 3, pp. 242–251, 2 graphs, 1929.

The author states that in estimating to what extent decay is likely to develop in the new plantations of exotic conifers now being laid down in Great Britain recourse must be had to the experience of foreign foresters, especially to those working in areas to which the species concerned are indigenous.

Decay in standing timber has so far been extensively studied only in western and central Europe and North America, from which regions come the species recently introduced into Great Britain. The heart rots present in Europe and America are similar in type, but whereas in America the principal cause of decay is heart rot of the main stem due to wound infection, mainly by *Trametes pini*, in Europe the commonest heart rot fungus, *Fomes annosus*, enters through the roots and chiefly affects the butt of the tree. *F. annosus*, though common in North America, causes no appreciable loss there, its place being taken by *Polyporus schweinitzii*, which is hardly ever recorded in Europe. Also North American, unlike European, investigations into decay of standing timber have been carried out mainly in virgin forests, where much of the timber is commercially over-mature [cf. *R.A.M.*, viii, p. 539].

After a discussion of the relation between decay and such factors as length of rotation, manner of regeneration, and soil conditions, the author points out that cultivated forests are not always planted in localities where the edaphic and climatic conditions are suitable, and that the farther a cultivated species is removed from the zone of its natural distribution the less likely it is to find a suitable habitat. The chief species so removed in Europe are Norway spruce [*Picea excelsa*] and larch [*Larix europaea*], and these in their new environment have suffered most from *F. annosus*. In continental Europe spruce is most affected and in Great Britain larch.

The control of heart rot largely consists in avoiding over-mature stands. As the onset of decay is so long delayed in Douglas fir [*Pseudotsuga taxifolia*] and western white pine [*Pinus monticola*], felling in the case of these trees has only to be effected at a suitable age for fungal attack to be avoided. The main problem is to arrange the proper distribution of species according to their edaphic and climatic requirements, as little doubt exists that the chief cause of fungal decay during the first fifty years in the life of a plantation is the death of the roots owing to unsuitable soil. Careful silviculture also prevents decay by producing a type of tree bearing a minimum of dead snags or other places where fungi are likely to enter, and by giving individual trees an opportunity to develop healthily.

Savulescu (T.) & Rayss (T.). **Un parasite des Pins peu connu en Europe. Neopeckia coulteri (Peck) Sacc.** [A Pine parasite little known in Europe. *Neopeckia coulteri* (Peck) Sacc.] —*Ann. des Épiphyties*, xiv, 4, pp. 322–353, 2 pl. (1 col.), 20 figs., 2 maps, 1929.

This is a detailed account of the morphology, cytology, and biology of *Neopeckia coulteri*, which was recently recorded by the authors on the needles of *Pinus pumilio* in the Carpathian mountains [*R.A.M.*, viii, p. 616]. In addition to the information already published, it is stated that the perennation of the fungus is ensured by a hibernating mycelium which shelters in the space between the base of the needles and the scales at the apex of the shoots, and also in cracks in the surface of longer twigs. It consists of black, coralliform clumps of crowded, minute cells with very thick walls. Each cell is capable in early spring of producing a thick-walled process, which later elongates and branches into the usual thin-walled hyphae, the new invasion thus proceeding from the base towards the apex of the needles. This hibernating mycelium was also found in North American specimens of *N. coulteri* which were examined.

On meeting a stoma the invading hyphae enter the suprastomatal hollow, where they form a large clump consisting of short, swollen cells. They were never observed, however, to enter the sub-stomatal chamber. In some cases, the hyphae were seen to penetrate the cuticle by means of a filament resembling a haustorium, which, on reaching the inner surface of the cuticle, assumes a rounded shape. The cuticle is usually pierced at the junction of two epidermal cells, but it may also be penetrated at a point over an epidermal cell. Once such a haustorium is formed, the hypha bearing it appears to be stimulated to the production of other similar processes.

In a comparative table are shown the chief macro- and microscopical differences between *N. coulteri* and *Herpotrichia nigra*, which allow of distinguishing the two organisms at all stages of their development.

Dufrénoy (J.). **Les Phomopsis des conifères.** [The species of *Phomopsis* on conifers.]—*Ann. Cryptogamie Exot.*, ii, 2, pp. 168–169, 1929.

This paper contains a very brief account of *Phomopsis pseudotsugae* and some notes on the taxonomy of other species of this genus which occur on conifers in Europe; all the information has already been noticed from other sources [*R.A.M.*, viii, pp. 278, 279].

Etter (Bessie E.). **New media for developing sporophores of wood-rot fungi.**—*Mycologia*, xxi, 4, pp. 197–203, 2 pl., 1929.

A brief description is given of experiments in which the author succeeded in obtaining normally developed pilei of a number of wood-rotting fungi, including *Lentinus lepideus*, *Pleurotus ostreatus*, *Polyporus arcularius*, *P. perennis*, *Ganoderma curtisii*, *Trametes peckii*, and others, in pure culture. The medium best adapted to this end consisted of 48 gm. maize meal, 16 gm. maize

starch, and 8 gm. powdered wood (the species of which is dependent in some cases on the nature of the fungus cultured), to which was added an amount of malt liquid (25 gm. malt extract in 1 l. water) sufficient to saturate the solid mixture and to fill the culture flask to about two-thirds of its capacity.

Lagerberg (T.), Lundberg (C.), & Melin (E.). **Biological and practical researches into blueing in Pine and Spruce.**— *Svenska Skogsvårdsföreningens Tidskr.*, *1927*, 2, pp. 145–272; 4, pp. 561–739, 2 col. pl., 71 figs., 22 graphs, 1928. [Swedish summary. Received November, 1929.]

This is a comprehensive account, accompanied by numerous tables, of the authors' investigations on the blueing of pine (*Pinus sylvestris*) and spruce (*Picea excelsa*) in Sweden. Following some general observations on the previous literature concerning the origin of blueing, the various forms of discoloration, the appearance of the condition in the open, and the possibilities of dissemination of the causal organisms, illustrated descriptions are given of the symptoms, life-history, and mode of infection of the fungi responsible for the defect in Sweden, the new genera and species being furnished with Latin diagnoses.

Ceratostomella coerulea is one of the most widespread and active blueing fungi, producing an intense, almost blue-black discoloration in pine and a fainter, less extensive stain in spruce. *C. piceae* [*R.A.M.*, viii, p. 345] causes a much fainter discoloration than the foregoing. *C. pluriannulata* was only found once in nature, on sawn spruce timber. *C. pini* [ibid., vii, p. 211] is one of the most important agents of blueing in Sweden, especially on pines.

Endoconidiophora coerulescens Münch has been found in nature producing a uniform blue-grey discoloration on both pine and spruce. The fungus emits a strong odour of amyl acetate.

Sclerophoma entoxylina Lagerberg & Melin n. sp. produces a greyish-black discoloration on pine and spruce. The olivaceous hyphae in the medullary rays are straight and up to 15 μ in diameter. Chlamydospores are commonly formed in older hyphae. The globular pycnidia measure 150 to 300 μ in diameter, and the hyaline, uni- or more rarely bicellular conidia, 6 to 9 by 3 μ.

Discula pinicola, believed to be common on stored pine logs, has been determined by comparison of material as identical with *Ligniella pinicola*, described by Naoumoff [in the paper noticed in this *Review*, v, p. 610] in 1926. Specimens submitted to Petrak, however, were placed in the genus *Discula*. It is therefore named *D. pinicola* (Naoumoff) Petrak. A variety, *mammosa*, occurs both on pine and spruce, and is marked by sparse pycnidial production and abundant sclerotial formation. The dark brown hyphae of *D. pinicola* var. *mammosa* approximate largely to the *Hormiscium* type, having short swollen cells and measuring up to 12 μ in breadth. The unicellular, hyaline, fusiform conidia measure 6·5 to 9·3 by 2·3 to 2·8 μ, and the black, cushion-shaped sclerotia may attain a diameter of 2 mm. The average size of the conidia developing from the multilocular pycnidia which occasionally appear in the stromata after a long period of growth is 5·6 by 3·7 μ. In a forest of 100-year-old branded spruce trees the incidence of blueing due

to this organism after four years was 80 per cent., with 14 per cent. decay.

Hormonema dematioides n. g. et sp., the synonymy of which is fully discussed, is considered to embrace Hedgcock's *Hormiscium gelatinosum*, Willkomm's *Xenodochus (Torula) ligniperda*, and probably Neger's *Dematium pullulans*. It was isolated from sawn pine and spruce timber, and from living pine needles in association with the completely colourless *Hormonema pallida*. *H. dematioides* produces a dark grey to olive-green discoloration, and is characterized by olivaceous to black, sometimes roughened hyphae, up to 10 μ in diameter, composed of *Coniothecium*-like groups or moniliform chains of cells, sometimes developing into irregular clusters of the *Sarcina* type, and by hyaline to olive uni- or bicellular conidia measuring 6 to 11 by 3 to 5·25 μ.

Trichosporium tingens n. sp. was isolated from stored pine timber, on which it produces a greyish-black discoloration. The erect, branched, densely aggregated conidiophores form clusters 1 mm. in diameter, and bear apically on their terminal and subterminal branches, spherical, hyaline to brown, smooth conidia, 6 to 10·5 μ in diameter.

Hormodendrum cladosporioides (the identification of which with *Cladosporium herbarum* [ibid., iii, p. 52; iv, pp. 60, 195] is not accepted) is common on pine and spruce timber. It is thought to be probably the chief cause of surface blueing, and may also penetrate deeply both into pine and spruce wood, producing an intensive, almost black discoloration. *H. microsporum* n. sp., characterized by chains of hyaline, slightly curved, generally biguttulate conidia, 3·7 to 5·6 by 2 μ, was found causing a localized bluish-grey discoloration in the heartwood of a felled spruce trunk.

Leptographium lundbergii n. g. et sp. is characterized by straight, uni- or pluricellular, branched hyphae, erect, dark conidiophores with densely penicillate apices, and heads of hyaline to light brown, ovoid or piriform, subterminal conidia, measuring 8 to 12 by 4 to 6 μ. Possibly this species may be identical with *Scopularia venusta*. It was found causing an intensely blue discoloration of pine sapwood.

Cadophora fastigiata n. g. et sp., widely distributed on spruce and pine, is characterized by light brown, slender hyphae (3 μ in thickness) and ellipsoidal, hyaline to light brown conidia, produced endogenously in lageniform, single or clustered conidiophores, and measuring 4 to 6·7 by 2 to 2·7 μ. The fungus causes an intense blackish-grey discoloration on pine.

Penicillium biforme Thom is one of the most active agents of superficial blueing, especially on pine, on which it causes verdigris-coloured streaks.

The results of laboratory tests [which are fully described] showed that the blueing fungi require different quantities of oxygen for their development in the timber, *D. pinicola* and *T. tingens*, for instance, being more exacting in this respect than *H. dematioides* and *Ceratostomella pini*. No discoloration can take place at a water content approaching fibre saturation point (about 30 per cent. of the dry substance). The optimum temperature for the development of these organisms was found to be about 22° C., with

a minimum just above 0°. On the whole, spruce is a less favourable medium than pine timber for their development.

Full particulars are also given of an inquiry into the relative merits of different methods of timber storage and treatment from the standpoint of fungous infection.

Pilát (A.). **Hniloba tyček na vinicích Státní Vyšší Školy Ovocnicko-vinařské a Zahradnické na Mělníce.** [Rots of Vine props in the vineyards of the State High School of Pomology, Viticulture and Horticulture in Mělnik.]—*Pátá Výroční Zpráva Státní Vyšší Ovocnicko-vinařské a Zahradnické Školy* [*a t.d.*] *na Mělníce za školní rok 1928–29.* [*Fifth Annual Report of the State High School of Pomology, Viticulture, and Horticulture* [*etc.*] *in Mělnik for the academic year 1928–9*], Mělnik, pp. 95–111, 3 pl., 2 figs., 1929.

After indicating the considerable financial losses caused by various rots of vine props in Czecho-Slovakia, the author gives brief popular descriptions of the wood-rotting fungi which he has so far recorded on these props in the vineyards of the School of Viticulture in Mělnik, and also of the rots induced by them. The species that occur most often and are of the greatest economic importance there are *Poria vaillanti*, *Lenzites abietina*, *Merulius lacrymans*, *Coniophora cerebella*, and *Stereum sanguinolentum*. The other species listed are much rarer and of academic interest only: they comprise *Trametes odorata*, *Poria medulla-panis*, *Odontia corrugata*, *O. argutа*, *Peniophora incarnata*, *P. molleriana*, *Corticium confluens*, *C. laeve*, and *Dacryomyces deliquescens*.

No control measures against the decay caused by these organisms are discussed.

Spaulding (P.). **Decay of slash of Northern White Pine in southern New England.**—*U.S. Dept. of Agric. Tech. Bull.* 132, 20 pp., 2 figs., 1 graph, 1929.

This paper contains the results of preliminary investigations on the decay of slash (débris left after logging) of white pine (*Pinus strobus*) in New England.

The usual course of the process of decay is as follows. Fruiting bodies of wood-rotting fungi (chiefly *Lenzites sepiaria* and *Polystictus abietinus*) [*R.A.M.*, viii, p. 541] begin to form in the second year on the rough piles into which the slash is collected. By the fourth year rotting is well advanced, from the seventh to the ninth a flattening of the piles of slash is apparent, and by the fifteenth year most of the material is thoroughly rotted, except for some sound pieces of the smaller branches. By the twentieth year the disintegration has left only a mat of fibrous mould under the freshly fallen leaves of the new forest. Decay may be retarded for ten years in situations which are too wet or too dry for the optimum development of the fungi.

Of the 23 [listed] fungi implicated in the decay of white pine slash, *L. sepiaria* is responsible for the bulk of the rotting, followed by *P. abietinus*, the former attacking the smaller pieces at the top or sides of the piles, while the latter invades the sapwood of the larger pieces lower down. *L. sepiaria* continues to disintegrate the

heartwood after the sapwood is rotted. The other fungi concerned act as scavengers, occurring more or less indiscriminately on the wood left over by the two main rot-producing organisms. None of the fungi participating in the decay of slash, except possibly *Stereum sanguinolentum*, a serious enemy of living balsam fir (*Abies balsamea*) [ibid., vi, p. 265], appears to threaten the new forest following the one producing the slash.

Among the factors controlling the decay of slash, considerable importance must be attached to the nature of the timber. Thus, slash from well-grown white pine with relatively small, short branches is vigorously attacked and rots fairly quickly, while that from trees with long, large branches containing much red heartwood resists decay for a long period. Decay is retarded on western and northern slopes and accelerated on southern and eastern ones. The rotting process is further retarded on swampy soils, where the slash becomes waterlogged, and on coarse, leachy ones where moisture is reduced below the minimum requirements of most of the wood-rotting fungi.

CAMPBELL (W. G.) & BOOTH (J.). **The effect of partial decay on the alkali solubility of wood.**—*Biochem. Journ.*, xxiii, 3, pp. 566–572, 1929.

After a brief survey of previous work on the chemistry of decay in wood, the writers describe their comparative investigation of acid hydrolysis and decay in Sitka spruce [*Picea sitchensis*: cf. *R.A.M.*, vii, p. 687 ; viii, p. 476].

Three weighed samples of 60 to 80 mesh heartwood sawdust were sterilized in flasks and inoculated with *Trametes serialis* [ibid., viii, p. 689]. One sample was then left to decay for three months and the other two for four, at the end of which periods all were collected on linen filters, washed with cold water to remove acid, dried and sterilized by heating at 105° C. for 16 hours, cooled in desiccators, and weighed. Each sample was then divided into two portions, one for immediate analysis and the other to be first treated with 1 per cent. sodium hydroxide for one hour at 100°. The analytical data are tabulated and discussed.

The fungus was found to have behaved as a typical brown rot in the manner of its attack on the wood. Cellulose and pentosans were depleted, the content of the former being reduced from 62·6 per cent. in the original wood to 52·7 in one sample decayed for four months and then washed, and to 40 per cent. in one similarly treated but subjected also to the action of sodium hydroxide; the corresponding figures for the total pentosans in the same samples were 6·8 and 4·1 per cent., respectively, compared with 8·4 per cent. in the original. Lignin was only slightly reduced (from 26·2 to 25·9 and 22·5 per cent., respectively, in the two above-mentioned samples), while there was a corresponding fall in the methoxyl content from 4·7 to 4·2 and 3·5 per cent., respectively.

The sum of the four main constituents, viz., water-soluble material, cellulose, lignin, and pentosans exclusive of cellulose, amounted to 99·1 per cent. of the original wood, whereas the corresponding figures for the decayed samples were 95·58, 95·1, and 95·66 per cent., respectively. These facts agree with previous

work as showing that rotted wood contains a material which is insoluble in water and not determined as cellulose, lignin, or pentosans. This material is thought to be probably a carbohydrate degradation product, since only the carbohydrates in the wood had been seriously affected by decay.

The presence in both decayed and hydrolysed wood of a material insoluble in water but soluble in 1 per cent. sodium hydroxide is considered to indicate that, at any rate in its early stages, fungal decay of the brown rot type is, in effect, an acid hydrolysis. It seems further probable that the high degree of alkali solubility of the lignin in badly rotted wood is due, less to the direct effect of decay on the lignin complex than to the large increase of surface area of the lignin caused by the marked depletion of the carbohydrate components.

SNELL (W. H.). **The relation of the moisture contents of wood to its decay. III.**—*Amer. Journ. of Botany*, xvi, 7, pp. 543–546, 1929.

Continuing his investigations on the relation between the moisture content of wood and its decay [*R.A.M.*, v. p. 199; viii, p. 147], the writer here reports the results of studies carried out since 1927. The general procedure was similar to that used in previous experiments, with the substitution of certain improved methods of technique [which are indicated].

The upper limits of moisture content for optimum growth for the six fungi used in the tests, viz., *Lenzites sepiaria*, *L. trabea*, *Trametes serialis*, *T. carnea* (= *T. subrosea*), *Fomes roseus*, and *L. lepideus* (taken collectively) on four different woods were as follows: Sitka spruce [*Picea sitchensis*], 150 per cent. of the oven dry weight of the wood; southern pine [? *Pinus taeda*] sapwood, 100 per cent.; Douglas fir [*Pseudotsuga taxifolia*], 70 per cent.; and southern yellow pine [? *P. palustris*], 50 per cent. The corresponding inhibition points of decay were 190 to 200, 145 to 150, 110 to 120, and 75 to 80 per cent., respectively. From the results to date it appears that the amount of air present in a block when enough water is available to inhibit decay is about 20 per cent.

A brief outline is given of further experiments now in progress.

WOLMAN (K. H.) & PFLUG (H.). **Zinc meta-arsenite—a (proposed) new American wood preservative.**—*Indus. & Engin. Chem.*, xxi, 7, pp. 705–707, 1929.

The writers recapitulate their reasons for not accepting the claims of Curtin and his collaborators regarding the high degree of toxicity to *Fomes annosus* of zinc meta-arsenite [*R.A.M.*, viii, p. 691].

In a reply [on pp. 707–709], L. P. Curtin maintains that this preservative has given good results on telegraph poles, and that even in the Panama Canal Zone treated posts showed no decay after a year.

BROEKHUIZEN (S.). **Wondreaksies van hout. Het ontstaan van thyllen en wondgom in het biezonder in verband met de Iepenziekte.** [Wound reactions of wood. The development

of tyloses and wound gum especially in relation to the Elm disease.]—Thesis, University of Utrecht (Drukkerij 'Luctor et Emergo', Leiden), 78 pp., 1 pl., 14 figs., 1 graph, 1929. [German summary.]

The formation of tyloses in the vessels of the wood is not altogether due to the interruption of the water supply, as the process occurs also in vessels where there is no such interruption. A continuous water supply, however, does inhibit to some extent their formation.

The injection of chemical substances into the woody tissue induces a wound reaction. Some trees, e.g., elm, oak, *Robinia pseud-acacia*, and lime (*Tilia*) react by the formation of both tyloses and wound gum, while others, such as *Acer platanoides*, *A. pseudoplatanus*, and *Aesculus hippocastanum* produce wound gum only. Of the substances tested, the acids (especially oxalic) exerted the most intensive action on the tissues; the lower the hydrogen-ion concentration of the solutions the more pronounced were the effects of the injection. Elms (*Ulmus campestris* and *U. monumentalis*) reacted more rapidly and markedly to injurious influences than any of the other trees used in the trials.

Striking differences were observed between the degree of reaction of the woody tissues to chemical and parasitic influences, the latter represented by inoculation with cultures and filtrates of various fungi, e.g., *Polyporus squamosus* [*R.A.M.*, vii, p. 787], *Graphium ulmi* [ibid., viii, pp. 342, 343], and *Verticillium dahliae* [ibid., ix, p. 6]. The response to fungous invasion is manifested by a more intensive formation of tyloses and wound gum in the affected vessels and by a more profuse development of tyloses in the adjacent vessels.

The explanation advanced by Countess v. Linden and Miss Zenneck as to the bearing of alcoholic fermentation on the toxicity of *G. ulmi* [ibid., vi, p. 518] cannot be accepted in the light of the author's observations.

Wound gum and tyloses often develop simultaneously from identical causes. The wound gum is produced in the vessels in a similar manner to the tyloses, being formed in the parenchyma cells and subsequently entering the vessels through the pits. Both tylose and wound gum formation may be regarded as vital processes.

Brussoff's view that the substance found in the vessels of elms suffering from the Dutch elm disease is not wound gum [ibid., iv, p. 382] cannot be maintained on the basis of the author's investigations. The brown, granular masses in the vessels as well as the reddish-yellow, more homogeneous substance, were found to give the reactions of wound gum. Similar granular gum masses were produced as a result of infection by *P. squamosus*. In all cases these substances were formed in the adjacent parenchyma cells and entered the vessels through the pits.

A five-page bibliography is appended.

Reichert (I.) & Hellinger (E[sther]). **A blight of Beans in Palestine.**—Reprinted from *Yedeoth*, ii, 1–2, 5 pp., 3 figs., 1929. [Hebrew, with English summary.]

A bean [*Phaseolus vulgaris*] blight, characterized by mottling

of the leaves and desiccation of the stems and roots, is causing much damage over wide areas of Palestine from Judea to the Valley of Esdraelon. *Rhizoctonia bataticola* [*Macrophomina phaseoli*: see above, p. 67] was isolated from the diseased parts, sometimes in association with a species of *Fusarium* but usually alone. The former organism penetrates the root and stem tissues, including the wood vessels, and thus interrupts the water supply. Inoculation experiments were performed in November, 1927, bean seeds being sown in soil inoculated with the *Rhizoctonia*. The typical symptoms of the disease appeared in every case after 19 days, while the control plants remained healthy. The fungus was reisolated from the diseased material. *M. phaseoli* has further been isolated from a number of other hosts in Palestine including pepper [*Capsicum annuum*], strawberry, tomato, tobacco, eggplant, potato, cotton, and orange seedlings. All diseased material should be burnt and infected soil allowed to lie fallow for five years. The application of plant ash, potash, or lime to the soil is recommended.

Sawada (K.). **Onion rust fungus, Puccinia porri in Japan.**—*Rept. Nat. Hist. Soc. Formosa*, xix, pp. 180–185, 1929. [Japanese. Abs. in *Japanese Journ. of Botany*, iv, 4, p. (103), 1929.]

The author has already expressed his opinion that the red rust fungus of onions in Japan and Formosa is identical with *Puccinia allii* [*R.A.M.*, viii, p. 479]. He has since discovered, however, that *P. porri* also occurs, having found it on onions cultivated in Morioka (Northern Japan); only the uredo and teleuto stages were observed, aecidia being entirely absent.

Siemaszko (W.). **Szara pleśń Cebuli—Botrytis allii Munn.** [Grey mould of Onion—*Botrytis allii* Munn.]—Reprinted from *Roczniki Nauk Rolniczych i Leśnych* [*Yearbook Agric. and Sylvicult. Sciences*], xxi, 12 pp., 2 pl., 1929. [English summary.]

A brief account is given of a storage rot of onions which was observed during the winter of 1928–9 in the neighbourhood of Warsaw, and the causal organism of which was identified as *Botrytis allii* [*R.A.M.*, vii, p. 378], this being the first official record of the fungus from Poland. In describing the morphological and physiological characters of *B. allii* in nature and on various culture media, the author states that the differences noted by Walker between this species and *B. byssoidea* [ibid., vi, p. 267] are, as far as he can judge from the descriptions of both, too slight and not sufficiently convincing to justify their separation.

The control measures recommended are much on the same lines as those described by Walker.

Scaramella (Piera). **L'alternariosi o marciume nero delle Carote.** [Alternariosis or black rot of Carrots.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 2, pp. 226–237, 6 figs., 1929.

An account is given of the author's investigations into black rot of carrots (*Alternaria radicina*) [*R.A.M.*, ii, p. 5; vi, p. 269] reported, apparently for the first time in Italy, from the vicinity

of Florence in 1928. The disease, which was present under field conditions in May and June, affected the roots and above-ground parts of well-developed plants.

A. radicina probably lives saprophytically in the soil [loc. cit.], infection taking place when the fully grown primary roots offer only slight resistance, their increased sugar content aiding infection by exercising a strong chemotropic attraction for the fungus which, apparently, is unable to penetrate the deeper tissues of young, vigorous roots.

SASAKI (S.). **A Phomopsis disease of Soy-Bean.**—*Ann. Agric. Exper. Stat. Gov.-Gen. Chosen*, iv, pp. 1–28, 2 pl., 1929. [Japanese. Abs. in *Japanese Journ. of Botany*, iv, 4, p. (102), 1929.]

The *Phomopsis* disease of soy-beans, which renders the pods inedible, is stated to be widely distributed in Korea. The fungus appears to be identical with *P. sojae*, shown by Lehman in 1923 to be the imperfect stage of *Diaporthe sojae* [*R.A.M.*, iii, p. 377]. Good growth was made on various nutrient media, the mycelium developing most rapidly in 10 per cent. glucose or saccharose solution at 25° C. Viability was maintained for over 652 days on nutrient media.

PETRI (L.). **Sulle cause dell'arricciamento della Vite.** [On the causes of leaf roll of the Vine.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 2, pp. 101–130, 6 figs., 1 diag., 1929.

A full account is given of investigations conducted by the author from 1913 to 1918 into the etiology of leaf roll of the vine in Italy [*R.A.M.*, viii, p. 546]. The disease is considered to be same as that known in other countries as court noué, roncet, reisigkrankheit, &c. Initial tests [details of which are given] showed that recovery is exceptional: vines of the variety 420 A recovered readily, however, when the cuttings were taken from mother plants not seriously affected and were grown in a light soil not previously planted to vines and under climatic conditions in sharp contrast to those in which the mother plants had become diseased.

Pot tests in which healthy cuttings of Rupestris du Lot were planted in heat-sterilized and unsterilized soil brought from Palermo, where other Rupestris du Lot vines had long been affected with leaf roll, showed that during the second and third years of growth the disease appeared only in the plants in the unsterilized soil. Histological examination at the beginning of the second year of growth showed the presence, in the affected plants only, of intracellular cordons [ibid., vii, p. 556] in the wood and cortex of the branches and trunk. In a footnote it is stated that the presence of these bodies is definitely diagnostic, no case of leaf roll in which they were absent having been seen by the author in 17 years.

One pot containing sterilized and another unsterilized soil were placed in a greenhouse during winter at 14° to 18° C., and in the following spring were exposed for two to three hours to a temperature of −3° to 2°. As a result, stunting of the shoots was much

more marked in the affected than in the healthy plant, intracellular bodies being observed in the shoots only of the former.

Observations are considered to show conclusively that the causal organism of leaf roll is present in the soil [cf. ibid., viii, p. 14]. Reductions in temperature by acting on the growing branches cause the symptoms of the disease to become visible. The effect of sudden variations in temperature is seen in the varying amounts in which intracellular cordons are formed according to the weather; they are present in great numbers in affected American vines in Sicily but are scarce on these in north Italy.

Affected vines are found on soils through a wide range of P_H values. The only soil condition constantly associated with leaf roll is waterlogging.

When healthy shoots of 420 A and Catanese vines were grafted on to affected plants of Rupestris du Lot so that there was no organic union but only a passage of sap from stock to scion, the intracellular bodies did not form in the latter. Inoculations of healthy plants with the sap of diseased vines gave negative results. No transmission was ever observed from a diseased scion to a healthy stock, but, on the contrary, the former generally recovers rapidly. No infection occurred when a healthy vine was planted near a diseased one in clean soil.

When a root attached to a healthy vine growing in a pot containing sterilized soil was placed in contact with an affected plant in unsterilized soil in another pot the shoots which developed on that side of the healthy plant bearing this root showed signs of leaf roll, and later the whole plant became diseased although only one-tenth of its root system was in the infected soil. This is considered to indicate that the pathogen is present in the soil and that infection occurs through the roots.

When contaminated soil was sterilized and mixed with contaminated unsterilized soil in various proportions, the disease was transmitted only in mixtures containing not less than 10 per cent. of the latter. Diffusion of the pathogen through the soil does not appear to take place; water filtered through contaminated soil was also non-pathogenic. Contaminated sterilized soil became re-contaminated, however, when mixed with liquid expressed from other contaminated soil.

That even severely affected vines do not communicate the pathogen to the soil may be explained by the assumption that having entered the plant, this becomes diseased, and the pathogen sets up a close symbiotic relationship with the cytoplasm of the embryonal cells and becomes unable to resume its autotropic life in the soil. This process is connected with the continuity of the pathogenic stimulation arising in the primary and secondary meristems. An equally tenable view would be to consider the permanent disturbance in meristematic activity as due to a filterable virus or to the action from a distance upon the absorbing apparatus of the plant of the toxic metabolic products of a micro-organism. Investigations of these problems are in progress.

If a pathogen is not present in diseased veins, the chronic hereditary nature of leaf roll must be regarded as closely resembling a bud variation brought about by pathogenic stimulation.

As the bodies known to be present near the nucleus of the cells in certain tissues of plants affected with virus diseases closely resemble those which the author has observed [ibid., iii, p. 251] in the cells of the cambium, epidermis, and young medulla of vines affected with leaf roll, and which give rise to the intracellular cordons, and as also the disease is hereditary, the author considers it probable that leaf roll belongs to the virus group of diseases.

RAVAZ (L.). **Chronique : Le mildiou.** [Current events. Mildew.]—*Prog. Agric. et Vitic.*, xcii, 29, pp. 53–55, 1929.

Vine mildew [*Plasmopara viticola*] is becoming generalized in Algeria, where owing to the dry climate many growers do not trouble to spray the vines. In some localities it may cause up to 70 per cent. loss on vines given inadequate or belated treatment. The first treatment [with copper sulphate mixtures] should be very copious and should be applied as soon as the fruit clusters emerge or better still within a week from the first attack coming from germination of the winter spores in the soil. It is thus of cardinal importance to determine exactly the date of the first attack, which can be done by the aid of the numerous forecasting stations now in existence [see next abstract].

RAVAZ (L.). **Chronique : Le temps. Les vendanges.** [Current events : the weather. Harvests.]—*Prog. Agric. et Vitic.*, xcii, 37, pp. 245–249, 1 fig., 1929.

Owing to the scanty rainfall in the south of France early in 1929 no attack of vine mildew [*Plasmopara viticola*] occurred in this area, as the oospores failed to germinate at the normal period. The Montpellier forecasting station [*R.A.M.*, iii, p. 468] recommended two applications of copper sulphate mixtures to be given only in those localities which had experienced heavy showers ; some vineyards remained untreated, yet by 11th September no attack of *P. viticola* had been noted. These vines had ceased growth by the end of July, and the leaves, being adult, were no longer susceptible when eventually the winter spores germinated. Vines showing prolonged growth, those on new soils, and late vines which put out new shoots at the end of July showed a primary attack of *P. viticola*, originating from the soil, on the young leaves ; this was, however, unimportant, as only a few oospores germinated.

In the event of wet weather causing the old leaves to become infected the disease appears not as large blotches, as on young leaves, but as mosaic-like lesions, which bear conidial fructifications only if the atmospheric humidity is high. The oospores are formed in these non-fructifying lesions.

Losses in eastern and south-eastern France were at first unimportant, as in the south, but the disease affected the peduncles, stalks, and berries. The later showers, especially those in mid-August, brought on severe attacks, not on the stalks, which had already become lignified to a considerable extent, but on the berries, which were affected at their point of attachment to the pedicel, where they turned brown and withered ; these berries easily dropped when the vines were shaken.

Ravaz (L.). **Chronique ; Les brûlures des bouillies.** [Current events: scorching caused by mixtures.]—*Prog. Agric. et Vitic.*, xcii, 29, pp. 55–57, 1929.

The results of tests conducted by Faes and Staehelin at Lausanne [*R.A.M.*, viii, p. 482] to ascertain the amount of scorching caused on vine leaves by applications of different sprays and dusts are tabulated and discussed. They showed that neutral Bordeaux mixtures did not cause scorching, and that scorching was proportionate to the degree of alkalinity of the mixture [ibid., viii, p. 12], though lime by itself did not cause scorching. The addition of Schweinfurth [Paris] green, adhesol, or casein to alkaline mixtures did not appreciably increase their causticity. On very tender vines a slightly alkaline mixture should be used. At Montpellier the mixture used contains 600 gm. powdered lime per kg. copper sulphate and causes slight burns which, under the local climatic conditions, are of no importance; in wet localities slightly alkaline mixtures are recommended.

Jankowska (Krystyna). **Spostrzeżenia nad występowaniem chorób roślin uprawnych w woj. Lubelskiem w latach 1927 i 1928.** [Observations on the appearance of the diseases of cultivated plants in the district of Lublin during the years 1927 and 1928.]—*Mém. Inst. National Polonais d'Économie Rurale à Puławy*, ix, 2, pp. 574–595, 1929. [English summary.]

Brief notes are given on the diseases of cultivated plants and ornamental trees which were observed during 1927 and 1928 in the Lublin district of Poland. The diseases are arranged by their hosts, which are classified as cereals, field crops, industrial crops, vegetable and flower garden plants, and fruit and ornamental trees. Besides those described in a former paper [*R.A.M.*, viii, p. 422], the following fungi are stated to be new records for Poland. *Scolecotrichum graminis* was observed parasitizing cultivated rye and a number of wild and pasture grasses; wheat was attacked very occasionally and very slightly. *Gloeosporium caulivorum* [*Kabatiella caulivora*] occurred on an experimental plot of *Trifolium alexandrinum*, while other varieties of clover appeared to be immune. *Puccinia opizii* broke out fairly severely in 1928 on lettuce [ibid., viii, p. 630]; the uredo- and teleutospores of the fungus were found on species of *Carex*. *Colletotrichum circinans* was recorded on onions.

Annual Report for 1928–29 of the New Zealand Department of Scientific and Industrial Research.—66 pp., 2 pl., 1929.

This report contains, *inter alia*, the following items of phytopathological interest. Practically the whole of the malting-barley of Canterbury has been rendered free from smut [*Ustilago hordei* and *U. nuda*: *R.A.M.*, vii, p. 224] by seed treatment in bulk. Wheat seed-grain free from loose smut [*U. tritici*] is available for distribution to growers, the varieties represented being Solid-straw Tuscan, Velvet Ear, Major, Hunters, Dreadnought, Red Fife, Velvet Chaff, and Marquis.

SUNDARARAMAN (S.). **Administration Report of the Government Mycologist, Coimbatore, for 1928–29.**—Reprinted from *Rept. Dept. of Agric., Madras Presidency, for the official year 1928–29*, 27 pp., 1929.

Attempts are being made to develop varieties of rice resistant to blast (*Piricularia oryzae*) [*R.A.M.*, viii, p. 88] by crossing the reputedly resistant varieties E.B. 24, Co. 1, and Co. 4 with the susceptible Korangu Samba. The results of two years' manurial experiments indicate that susceptibility to *P. oryzae* is increased by liberal supplies of nitrogen, this effect being counteracted to some extent by potash but not by phosphoric acid.

A high degree of resistance to mosaic was shown by the P.O.J. sugar-cane varieties, while H.M. 313, 320, 332, and 554 proved very susceptible. Among the thin canes Chunnee, Co. 213, 210, 290, 281, and 223 were found to be susceptible, while Kassoer, Co. 205, 214, and 244 remained healthy throughout the varietal resistance tests. By strict attention to selection and roguing it has been possible to eradicate mosaic from the Imperial Sugar-cane Breeding and Government Agricultural Experiment Stations at Coimbatore.

Further studies have been carried out on the cotton (*Gossypium herbaceum*) boll rot and seedling blight associated with the fungus formerly referred to *Vermicularia* [loc. cit.] but now regarded as more correctly named *Colletotrichum* [ibid., viii, p. 268]. The optimum temperature for growth is between 30° and 35° C., with a minimum below 17° and maximum at 52°, while the optimum hydrogen-ion concentration for growth was P_H 5, and for sporulation 5·5. Saltation was observed on certain media. The organism was found in the seed coats in a viable condition. Better control of the disease was given by two applications of Bordeaux mixture to the seedlings than by seed treatment with sulphuric acid or a combination of the two treatments.

The pepper [*Piper nigrum*] disease known as 'pollu' [ibid., viii, p. 88] is now generally regarded as due to several causes, including a physiological disturbance resulting in spike fall, fungus infection produced by *C. necator*, and insect attack.

Macrophomina phaseoli, frequently found on wilted groundnut plants, was proved to be the pycnidial stage of *Rhizoctonia bataticola* [ibid., vii, p. 17; viii, p. 406]. All attempts to produce this stage in culture gave negative results, but it was occasionally obtained on seeds, young shoots, and stems of groundnuts artificially inoculated with *R. bataticola*. The pycnospores were found to retain their viability at laboratory temperature for 14 months. When the fungus was inoculated into germinating seedlings, 22 out of 29 developed infection; four seedlings ten days old inoculated in the collar region were killed; 4 out of 6 inoculated in the shoots contracted infection and died; and 4 out of 18 plants grown in infected soil died within six weeks. By the use of lime at the rate of 1,000 lb. per acre the number of wilted plants was reduced by nearly one-half in a soil treatment test. The incidence of wilt was found to be much higher in shallowly cultivated plots than in those dry to a depth of six or nine inches. None of the 20 groundnut varieties tested showed any definite resistance to infection.

Of the three organisms isolated from coco-nuts affected during the south-west monsoon by a new disease termed 'shoot rot', viz., *Gloeosporium* sp., *Fusarium* sp., and *Bacillus coli*, only the first-named was able to reproduce the typical symptoms of the disease in inoculated plants; the parasite is a very weak one, being dependent on extreme humidity.

A species of *Fusarium* isolated from the vascular bundles of plantains at Madura was identified by Wollenweber as *F. cubense* var. *inodoratum*, the cause of Panama disease.

PARK (M.). **Report of the Mycological Division.**—*Ceylon Dept. of Agric., Tech. Repts. for the year 1928*, pp. 1–6, 1929. [Received November, 1929.]

During 1928 serious attacks of mildew of *Hevea* rubber (*Oidium heveae*) were reported from various parts of Ceylon [cf. *R.A.M.*, ix, p. 55]. Bacterial wilt (*Bacterium solanacearum*) of Solanaceous plants caused considerable damage in village gardens where rotation was not practised, and in some districts has become a limiting factor in the cultivation of tomatoes and eggplants. Mosaic diseases of eggplants and okra [*Hibiscus esculentus*] were also recorded, more than 50 per cent. of the plants of the latter being affected in one group of gardens.

Inoculation experiments [by W. Small] indicated that *Rhizoctonia bataticola* [*Macrophomina phaseoli*] is capable of killing tea and other seedlings. A preliminary inoculation experiment on plantains demonstrated that it is possible that bunchy top is to some extent associated with root disease [ibid., vii, pp. 62, 224].

Isolations from mycorrhizal tea rootlets at Peradeniya consistently gave two fungi of the *Rhizoctonia* type, one of which resembled certain strains of *R. bataticola*.

A *Sclerotium* obtained from diseased rice plants is regarded as a non-chromogenic strain of *S. oryzae*. Laboratory inoculations of rice seedlings showed that both the typical form of *S. oryzae* and the non-chromogenic strain can infect roots and stems, whereas strains of *R.* [*Corticium*] *solani* can infect stems only [ibid., viii, p. 59].

New records made in 1928 included *Oidiopsis* sp. causing a powdery mildew of the leaves of pigeon pea (*Cajanus indicus*), *Sporotrichum citri* causing scab of grapefruit (*Citrus maxima* var. *uvacarpa*), and *Macrophoma* sp. causing stem disease of blue gum seedlings (*Eucalyptus globulus*). *Macrophomina phaseoli* was noted on several new hosts in Ceylon, including avocado, areca palm, and sweet potato; on the last-named it produced a charcoal rot of the tubers.

STOREY (H. H.). **Plant pathology.**—*First Ann. Rept. East African Agric. Res. Stat., Amani, 1928–29*, p. 12, 1929.

Five virus diseases affecting important crops are under investigation at the recently re-established Agricultural Research Station for East Africa, at Amani in the Usambara mountains, Tanganyika Territory, viz., mosaic of sugar-cane, streak disease of maize and

other Gramineae, rosette of groundnut, curly leaf of cassava, and mosaic of tobacco. The insect vector of streak, *Cicadulina mbila* [formally known as *Balclutha mbila*: *R.A.M.*, viii, p. 756], has been found in Tanganyika, Kenya, and Uganda. Tobacco at Amani and in Zanzibar suffers from a serious disease, apparently of physiological origin, characterized by extreme crumpling and malformation of the foliage. A non-parasitic disturbance of sisal and a bark disease of coffee in western Usambara are also receiving attention.

SHARPLES (A.). **Division of Mycology. Annual Report for 1928.** —*Malayan Agric. Journ.*, xvii, 8, pp. 294–303, 1929.

In this report the author states that the information obtained indicated definitely that lightning is an important factor in the causation of the death of palms, especially of tall coco-nuts, in Malaya [cf. *R.A.M.*, vi, p. 656; viii, p. 305], where, probably, no definitely parasitic form of epidemic coco-nut bud rot exists.

A root disease of the oil palm associated with a species of *Ganoderma* was found on several estates. In a case examined, the disease appeared to have originated from a large, decaying jungle root; the affected roots were growing through this, and most of the larger ones showed a brown rot. The jungle root and the palm roots contained the same mycelium. The fungus had passed up the stem of the palm and the decay extended to within two feet of the crown. All the stem tissues from the base to half-way up were involved, but near the limit of decay the central tissues were sound and bounded on both sides by a diseased zone.

Pythium aphanidermatum was isolated from diseased zinnias and *Amaranthus*.

Inoculation experiments showed that, of the 15 varieties of bananas tested, Pisang Embun and Pisang Rastali were definitely susceptible to Panama disease [*Fusarium cubense*]; the disease was transmitted through the parent rhizomes to the daughter suckers [cf. ibid., vii, p. 652]. An outbreak of Panama disease of bananas in Perak was associated with a fungus closely resembling *F. cubense* var. *inodoratum*.

Successful inoculations were made on Solanaceous plants with a bacterium isolated from the gummy exudate of a banana sucker in Johore showing a wilt disease apparently similar to that reported from Trinidad as due to *Bacterium solanacearum* [cf. ibid., viii, p. 390].

A leaf disease of sisal seriously interfering with fibre extraction, as only short fibres were obtained from the affected leaves, was attributed to a species of *Fusicoccum*.

Spotted tea leaves from Cameron's Highlands were attacked by *Phyllosticta theae*.

[WALTERS (E. A.).] **Report on the Agricultural Department, St. Lucia, 1928.**—31 pp., 1929.

In the section of this report dealing with plant diseases (pp. 10–12) it is stated that owing to a wet season the first flowering of

limes in St. Lucia in January, 1928, was practically a failure owing to blossom blight [*Gloeosporium limetticolum*: *R.A.M.*, viii, p. 20], but a good recovery was made later. Most of the trees appear to have changed their mode of growth by sending out short-jointed shoots from the bases of leaders spurred back by wither-tip; these shoots mature rapidly and become woody, thus having an advantage over the long, soft shoots, which readily become diseased and do not flower. Well-nourished, healthy trees recover more readily than others from the wither-tip stage and are able to put forth dormant buds which usually flower later on.

A systematic survey of coco-nuts, in which 324,062 trees were examined, showed that 568 were affected by various diseases [which are briefly described]; of this number bud rots (*Phytophthora palmivora* or bacterial infection) accounted for 201, little leaf [ibid., vii, p. 305] for 119, and bitten leaf [*Thielaviopsis paradoxa*: ibid., vii, p. 629] for 100. The conditions referred to as withering leaf and leaf yellows appear to be due to malnutrition; the former is marked by the breaking down of dry, withered leaves which remain attached to the trunk. Decay starts at the point of attachment where leaf abscission is incomplete and wounds are caused by premature breaking down. Most of the affected trees are on arid lands subject to alternate drought and waterlogging.

Record of current work, January 1 to March 31, 1929.—*U.S. Dept. of Agric., Plant Quarantine and Control Admin. Leaflet* 98, 48 pp., 1929.

During the year 1928 about ten and a half counties in Illinois, Michigan, Montana, and Ohio were surveyed for the first time in connexion with the barberry eradication campaign against black stem rust of cereals [*Puccinia graminis*], while about 15 were inspected for the second time. The total number of bushes destroyed was 1,520,832. During the ten years of the campaign (from 1918 to 1928) an area equivalent to about 892 counties has been covered in the first survey of cities, towns, and farmsteads, leaving only 29 to be done. About 27 per cent. of the total number of counties ultimately to be covered by the first survey have been inspected for the second time. In all, 17,587,276 bushes have been destroyed during the period of the campaign [cf. *R.A.M.*, viii, p. 228 and below, p. 97].

Practically all the trees found to be infected by larch canker [*Dasyscypha willkommii*: ibid., viii, p. 537] are reported by the Bureau of Plant Industry to have been destroyed. About 20 infested properties were found in three different stations near Groton and Ipswich, Massachusetts, and Providence, Rhode Island.

Cook (M. T.). **Report of the Division of Botany and Plant Pathology.**—*Ann. Rept. Insular Exper. Stat. Porto Rico, Fiscal Year 1927–1928*, pp. 59–66, 1929.

Brief notes are given on the phytopathological work in progress at the Porto Rico Department of Agriculture Insular Experiment Station, Rio Piedras, together with a list of the diseases of some of the more important crops.

Ultée (A. J.). **Verslag over de werkzaamheden van het Proefstation in het jaar 1928.** [Report on the work of the Malang Experiment Station in the year 1928.]—*Meded. Proefstat. Malang*, 69, 64 pp., 1929.

This report contains the following scattered references of phytopathological interest. Further investigations were conducted on the top die-back of coffee [*R.A.M.*, viii, p. 238], which also occurred in the Kloet and Semeru districts of Java and on one estate in the central region of that country. The seed of diseased bushes was examined for the presence of the fungus previously reported as occupying the tracheae, but without success. None of the organisms isolated from diseased wood [loc. cit.] reproduced the typical symptoms of die-back on inoculation, and it is concluded that they are not the primary cause of the disturbance. No improvement in the condition of the affected bushes resulted from injections of copper sulphate, sulphuric acid, or Ilisch's preparation [cf. ibid., vii, p. 682].

The fructifications of the brown root fungus of coffee (*Fomes lamaoensis*) were observed, for the first time in Malang, during the year under review. The fruiting bodies of *Xylaria* [*thwaitesii*], the usually accepted causal organism of black root rot [ibid., vii, p. 20], are also very scarce, and it is thought that some of the infection ascribed to this fungus may really be due to *Rosellinia* [see below, p. 129]. A species of *Nectria* has been found in the discoloured red wood of coffee bushes which died suddenly on one estate in Sumatra, and also on *Crotalaria* spp. serving as green manures in the same gardens. The disease was apparently highly infectious and is thought to have spread from *Crotalaria* to coffee, but for the present its progress has been arrested by the eradication of all suspected material.

Some details are given relating to experiments in the control of rubber mildew [*Oidium heveae*: ibid., viii, p. 461] by the application of various fertilizers and by spraying with sulfinette, sulphur emulsion, or lime-sulphur. No definite conclusions as to the efficacy of these methods have yet been reached.

Centrosema pubescens and *Leucaena glauca* were attacked by *Septobasidium rubiginosum* [ibid., vii, p. 63].

Rémy (Mlle L.). **Sur l'étiologie et la thérapeutique de tumeurs végétales d'allure maligne.** [Note on the etiology and therapeutics of plant tumours of malignant aspect.]—*Comptes rendus Acad. des Sciences*, clxxxix, 14, pp. 495–496, 1929.

The author states that in her experiments slight but repeated applications of ether to the nodes of geranium plants succeeded in causing the development on the portions treated of papillomata, which at first only involved the cortical tissues, but later occasionally spread into the underlying tissues and then took the form of rudimentary organs or other malformations. Such tumours are very slow in developing, but their growth is continuous, and cases were observed in which hypertrophies of a similar nature appeared on the neighbouring or more distant nodes (more rarely on the internodes) some time after the applications of ether had been discontinued. In another series of experiments geraniums kept behind

a window which was never opened in a poorly ventilated room developed, at the end of 15 months, similar tumours to those described above.

Irradiation with small doses of ultra-violet rays stimulated the development of the experimental papillomata, which doubled their area in a few days; a similar but much weaker stimulating action was also exerted by ordinary sunlight when concentrated on the papilloma through a lens. An entire regression of the tumours was obtained in one to three weeks by applying a magnet to their surface; an application of the magnet for three or four days was sufficient to arrest the proliferation of the abnormal cells. Normal cells of the plant did not appear to be affected by the treatment.

Siegler (E. A.) & Piper (R. B.). **Aerial crown gall of the Apple.**—*Journ. Agric. Res.*, xxxix, 4, pp. 249–262, 4 pl., 1929.

The results of inoculation experiments [details of which are given in tabular form], which were carried out in 1927 and 1928, showed that the apple strain of *Bacterium tumefaciens* isolated by Siegler from woolly knot crown galls of apple [*R.A.M.*, viii, p. 249] readily caused infections on the stems of apple seedlings raised from seeds of varieties susceptible to the aerial form of crown gall, and on the wood of 10-year-old Early Ripe and Givens apple trees. Another strain, apparently identical with the daisy (peach) strain described by Smith and his co-workers, with rare exceptions failed to cause infection on the same hosts.

The reactions obtained with the apple strain on shoots of various ages were macroscopically indistinguishable, in their incipient stage, from the small swellings that are commonly found just above the bud and are generally considered to be aphid injury; in more advanced stages they were morphologically identical with the malformations known as aerial crown gall, stem tumour, or burr knot [ibid., vii, p. 647]. In some cases the small swellings enlarged rapidly, until they consisted of a mass of roots projecting through the epidermis. When shoots of the current year were girdled at the base by a knife smeared with the inoculum, root primordia appeared on the girdled areas, a result which may account for the occurrence of aerial galls on pruning wounds. The artificially produced aerial galls developed into the woolly knot type of crown gall when planted in soil.

The causal organism was fairly consistently reisolated from relatively young infections, but never from older artificial infections or from naturally occurring aerial galls of any age. It is suggested that the organism only survives for a short time in the artificially produced galls, and may also die very readily in the natural galls, since, in the authors' opinion, these malformations are not the product of hyperplasy, but are organizations similar to a teratoma, which may not offer conditions favourable for the continued growth of the bacterium. It is also considered that the evidence supplied by this investigation tends to support the hypothesis that aerial crown galls on apple are the result of infections with the apple strain of *Bact. tumefaciens*, but does not preclude the possibility that other agencies may also be involved in their causation.

Haskell (R. J.) & Wood (Jessie I.). **Diseases of cereal and forage crops in the United States in 1928.**—*Plant Disease Reporter, Supplement* 71, pp. 259–323, 2 maps, 1929.

This report, prepared on the usual lines [*R.A.M.*, viii, p. 21], contains numerous interesting references of which only the following can be mentioned. Wheat scab (*Gibberella saubinetii*) was unusually serious throughout most of its normal range in 1928, the Corn Belt States generally reporting an increased incidence of infection, sometimes accompanied by heavy damage. Barley was also more severely injured by scab in 1928, when it was extensively grown in the Corn Belt, than in any other year for which records are available.

Five different kinds of foot rot of wheat are stated by Dr. H. Fellows to be recognized in the United States, viz., take all (*Ophiobolus graminis*) [ibid., viii, pp. 369, 370], *Helminthosporium* foot rot (*H. sativum*), two distinct *Fusarium* rots, and one of unknown origin which has occurred in Oregon and Washington for the last twelve years. The effects of this last disease are not usually apparent until the wheat is approaching maturity, when the stems crinkle at the base, fall over, and lie flat on the ground. At the point of crinkling the stems are shrunken and disintegrated. The estimated average annual loss from this cause in Oregon during the last four years is about 75,000 bushels, the corresponding figure for Washington being about 20,000.

Lucerne in Salt Lake County, Utah, has been affected since 1924 by an apparently new disease of the witches' broom type which seems to be an important factor in the reduction of stands. The most conspicuous symptom of the disturbance is a marked increase in the number of stems arising from the axils of the leaves, that of the scales at the stem base, and adventitiously throughout the whole circumference of the crown. A single diseased crown may produce from 50 to 300 stems, which are uniformly shorter than those from normal plants and in advanced stages of infection may not exceed 3 to 5 inches in height; they are also very spindly and sometimes unable to stand erect. The leaves of affected plants are small and abnormally rounded, with a purplish discoloration and marginal yellow stain. The disease is of the systemic type and somewhat resembles certain troubles belonging to the virus group.

Allen (Ruth F.). **Concerning heterothallism in Puccinia graminis.**—*Science*, N.S., lxx, 1813, pp. 308–309, 1929.

This is a preliminary account of the writer's cytological study of infections of *Puccinia graminis* on the European barberry [*R.A.M.*, viii, p. 764]. An isolated infection consists of haploid mycelium and pycnidia. Numerous pycnospores are formed and the drop of pycnidial exudate on the upper leaf surface persists for five or six weeks or even longer. Structures resembling aecidia, but actually consisting only of haploid mycelium, are formed at the normal time and place. They develop and undergo the first differentiation into an outer half of large, rounded empty cells and an inner half of small, dense, living cells. As a rule, no

spores are produced, and after further expansion the whole structure dies.

After pycnospores of different infections have been mixed, an examination of the pycnidia reveals the presence of binucleate cells in the upper part of the pycnidial wall near the base of the paraphyses. Leading downwards from this area are hyphae, the cells of which contain two, three, or more nuclei. Binucleate cells may also occur at the base of the pycnidium. The region between the pycnidium and a young aecidium is occupied by many haploid and a few diploid hyphae.

The aecidium begins as a loose tangle of hyphae, predominantly uninucleate but usually comprising a few binucleate cells. In later stages the latter are regularly present, scattered here and there in the haploid mass. Towards the time of aecidiospore formation the central diploid cells enlarge and often become multinucleate as they turn towards the lower leaf surface. These become the basal cells of the spore chains, which at maturity consist of regularly binucleate cells. In older infections where successive aecidia are in process of formation, diploid hyphae may be found between the older and the younger aecidia. As soon as aecidiospore formation begins, the production of pycnospores is arrested and the pycnidial exudate dries.

STAKMAN (E. C.). **Physiologic specialization in plant pathogenic fungi.**—*Leopoldina (Amerikaband)*, Quelle & Meyer, Leipzig, pp. 263–289, 7 pl., 1 graph, 1929.

In this paper, based on a lecture given in 1927 under the joint auspices of the Mayo Foundation of Minnesota University and the Graduate Schools of Wisconsin and Iowa Universities, the author discusses the importance of a knowledge of physiological or parasitic specialization in plant pathogens as a means for their control, with special reference to black stem rust of cereals (*Puccinia graminis*). Physiological specialization as a basis for the establishment of plant quarantines, and as a factor in the development of disease-resistant varieties is briefly discussed. An analytical key is furnished to the physiological forms of *P. graminis* within the genus *Triticum*, and a bibliography of 146 titles is appended. Much of the recent literature cited in the paper has been noticed in this *Review*.

HARRINGTON (J. B.) & SMITH (W. K.). **The inheritance of reaction to black stem rust of Wheat in a Dicoccum × Vulgare cross.**—*Canadian Journ. of Res.*, i, 2, pp. 163–188, 2 pl., 1929.

Full particulars, accompanied by 16 tables, are given of the authors' researches on the inheritance of reaction to black stem rust of wheat (*Puccinia graminis tritici*) in a cross between the highly resistant Vernal (*Triticum dicoccum*) and the susceptible Marquis (*T. vulgare*) [*R.A.M.*, viii, p. 29].

A large F_2 population of the cross was grown under severe natural epidemic conditions in the field at Saskatoon, Saskatchewan, and hundreds of F_3 progenies were exposed in the seedling stage, under controlled conditions, to pure physiological forms of

the rust. Resistance in the field proved to be incompletely dominant and was apparently governed by a single genetic factor. Marquis and Vernal were found to differ in one main genetic factor Rb, for seedling reaction to form 21 of the rust. This factor, carried by Vernal, also governs seedling resistance to forms 17, 19, and 36, and seems to be responsible for the slight seedling resistance of Vernal to form 27. There was some evidence that the factor Rb is identical with that controlling the resistance of the F_2 plants to forms 17, 21, 29, and 36 in the field. A different factor, Ra, causes the resistance of Marquis seedlings to form 27. The resistance of Vernal did not appear to be closely correlated with its seed shape or with the adherence of the glumes to the seed.

Newton (R.), Lehmann (J. V.), & Clarke (A. E.). **Studies on the nature of rust resistance in Wheat. I. General introduction. II. Physico-chemical properties of host-cell contents. III. Culture and injection experiments to demonstrate inhibiting or accessory substances.**—*Canadian Journ. of Res.*, i, 1, pp. 5–35, 1929.

A comprehensive account, accompanied by tables, is given of the authors' studies, occupying a period of three years, on the nature of the properties governing the resistance of wheat to stem rust (*Puccinia graminis tritici*).

Eight varieties, differing widely in their reaction to stem rust, were used in the tests, viz., Little Club, Marquis, Mindum, Kubanka, Kota, Kanred, common emmer, and Khapli, the first-named being highly susceptible and the last very resistant, while the remainder are intermediate [*R.A.M.*, viii, p. 707]. The seed was sown on 4th May, 1926, at Edmonton, Alberta, and determinations made on various physico-chemical properties of the host cell contents at four subsequent dates between 9th June and 22nd July. Distinct varietal differences in osmotic pressure, electrical conductivity, hydrogen-ion concentration, total solid content, and bound water were observed, but no evidence was obtained that any of these are consistently related to rust resistance.

A series of experiments [the technique of which is described] was conducted to test the validity of the hypothesis of inhibitory or accessory substances in connexion with susceptibility to rust. The expressed sap of resistant seedling plants was administered (after extraction or filtration) to susceptible varieties (or vice versa) (*a*) by addition to water cultures of the seedlings; (*b*) by addition to Petri dish 'cultures' of leaves [ibid., iv, p. 575; viii, p. 495]; and (*c*) by direct injection into the leaves of plants growing in ordinary soil. None of the attempts to induce susceptibility in normally resistant varieties proved successful. On the other hand, the administration of filtrates from the resistant Khapli and Vernal emmer to the susceptible Marquis and Little Club resulted in some cases in a reduction of the incidence of infection. The injection of the juice of diseased leaves into healthy ones failed to demonstrate the presence of any toxin excreted by the fungus. A reduction of the amount of infection in the susceptible varieties was further effected by the injection of the phenolic compounds, salicylic acid, catechol, or vanillin in appropriate concentrations (1:00

p.p.m. for the first-named, 330 p.p.m. for the second, and higher strengths for the last). The germination of the uredospores of *P. graminis* form 21 was inhibited in filtrates of Khapli and Marquis, and in solutions of salicylic acid, catechol, and vanillin (above 50, 200, and 250 p.p.m., respectively). At very low concentrations the phenolic compounds stimulated the growth of *Helminthosporium sativum*, while at higher ones they inhibited it.

A bibliography of 79 titles is appended and the work of previous investigators discussed in an introductory section.

Newton (R.) & Anderson (J. A.). **Studies on the nature of rust resistance in Wheat. IV. Phenolic compounds of the Wheat plant.**—*Canadian Journ. of Res.*, i, 1, pp. 86–99, 1 diag., 1929.

In connexion with studies on the nature of resistance to rust [*Puccinia graminis*] in wheat [see preceding abstract], the theory is advanced that this phenomenon may be due to the liberation of phenols in the host cell on the entrance of the fungus. A tentative method [details of which are given] has been developed for the determination of phenolic compounds in the expressed juice of wheat, and a critical investigation was made of the conditions necessary for the clarification of the juice with tungstic acid. The content of phenolic substances in wheat juice was found to bear some relation to rust resistance, the highly resistant Khapli variety containing a larger proportion (15·6 mg. resorcinol per 100 gm. juice in 1927 and 12·7 in 1928) than any of the other eight tested except Kubanka (16 mg. resorcinol in 1927 and 12·9 mg. in 1928). Yellow pigments of the flavone type appear to be the main phenolic compounds present.

Pridham (J. T.). **Some observations on rust resistance in Wheat.**—*Agric. Gaz. New South Wales*, xl, 9, pp. 632–633, 1929.

During 1929, wheat in the vicinity of Cowra, New South Wales, was more severely affected by stem rust [*Puccinia graminis*] than at any time since 1916.

The growing of rust-resistant varieties of wheat is not considered to be of the first importance in most of the new South Wales wheat belt, as very little rust is usually present; the Agricultural Department still highly recommends Federation, Yandilla King, and other susceptible varieties.

Clarendon, Florence, Gluyas Early, and Thew are considered to be among the most resistant early varieties, while Waratah and Binya, though affected at Cowra, gave satisfactory grain and yields. Early varieties badly affected in the grain were Bald Early, Garra, Bohin, Improved Steinwedel, and Ranee. Mid-season to late varieties which, though rusted, had satisfactory grain and the yield of which was not markedly affected, were Dundee, Nahawa, Warren, Burrill, and Barwang. Union, Penny, Federation, Bena, Exquisite, and Yandilla King were, however, badly attacked, the grain being pinched and much shrivelled and the yield markedly depreciated.

PELTIER (G. L.). **Some aspects of the spread of stem rust.**— *Centralbl. für Bakt.*, Ab. 2, lxxviii, 24–26, pp. 525–535, 1929.

In this paper the author summarizes his views, based on seven years' observations and intensive studies in Nebraska, on the spread of stem rust of cereals (*Puccinia graminis*) in relation to the barberry and to overwintering of the uredospores [*R.A.M.*, viii, p. 364].

In Nebraska the destruction of the barberry has resulted in the virtual eradication of stem rust on rye, which appears to be directly traceable to infected bushes, since the uredospores of this form do not overwinter in the south. No convincing evidence has been obtained during the period covered by the author's studies of the spread of stem rust of oats from infected barberries in Nebraska; the disease apparently enters the State from outside sources, possibly overwintering uredospores in southern Texas. To the north of Nebraska, however, oat rust is commonly spread by barberries.

Few barberries occur south of northern Kansas and they rarely become infected with *P. graminis* owing to the non-viability of the teleutospores, so that in northern Texas, Oklahoma, and southern Kansas stem rust must ordinarily be carried by overwintering uredospores. In Nebraska infection of cereals or grasses from the barberry has not been found more than $\frac{1}{8}$ of a mile from infected bushes during the period of primary infection (20th to 25th May), so that the infection from this source is local in contrast to the small amounts but widespread distribution of the primary uredosori not directly traceable to barberries and which appear about the first week in June in the south-east of the state, and later in the north and west. In one area of western Nebraska covering 1,200 square miles, the only ten barberry bushes found were eradicated before 1924, yet primary uredosori of stem rust occur annually in this region in small and widely scattered amounts.

The prevailing forms of *P. graminis* on wheat vary from year to year in Nebraska. Thus, form 11, which was generally distributed in 1924, was absent in 1925, though it reappeared in 1926. During 1925, form 36 was obtained from Oklahoma, later in Kansas, and eventually as primary uredosori in early June in south-eastern Nebraska. Form 18, found in Nebraska in varying amounts each year, and a number of other more or less common Nebraskan forms, have also been found south of the State. The prevailing winds during the period from May to July in Nebraska are from the south, so that the uredospores are conveyed northwards at a time when the wheat is approaching the heading stage; hence the abundance of infection in Nebraska at this time compared with the ordinarily more susceptible seedling time. Though the primary source of these spores is presumably southern Texas, the quantity of overwintered uredospores there is small; secondary infection from these, however, produces large amounts of rusts at times in the latter part of April. Further extension then occurs progressively into Oklahoma and Kansas. When stem rust reaches southern Nebraska (about the first week in June), the wheat is being harvested in northern Texas and southern Oklahoma, so that

infection not directly traceable to barberries must have originated from wind-blown spores in the intervening region.

LINDFORS (T.). **Några reflexioner angående årets svartrosthärjningar.** [Some reflections on the current year's black rust ravages.]—*Landtmannen*, xii, 38, pp. 811–812, 1929.

The prospects of a good wheat harvest in Sweden in 1929 are stated to have been largely spoilt, especially in the districts surrounding Lake Maelar, by the ravages of black rust [*Puccinia graminis*]. Such is the prevalence of the barberry in this region that scarcely a field can escape infection. Various reports in the local press to the effect that the disease was absent from places where barberries flourish, or that it occurred in fields at a distance from the alternate host, were found to be without foundation. Autumn wheat generally suffered more than the spring varieties; among the former Jarl was more susceptible than Thule II, while of the latter group Rubin and Diamant were much more resistant than Aurore. In conclusion the writer urges the necessity of effective legislation to secure the eradication of barberries as a means of control of black rust in Sweden [*R.A.M.*, vi, p. 282].

HERMELIN (G.). **Några tankar i Berberisfrågan.** [Some thoughts on the *Berberis* question.]—*Landtmannen*, xii, 39, pp. 829–830, 1929.

The writer supports Lindfors in his plea for barberry eradication as the first step towards the control of black rust of wheat in Sweden [*Puccinia graminis*: see preceding abstract]. Lindfors has shown in his book 'Berberisbusken og Berberisloven' [Copenhagen, 1915] that the eradication of the barberry led to the virtual extinction of the disease in Denmark [ibid., ii, p. 499], and similar results could no doubt be obtained in Sweden. On the writer's farm the bushes have been uprooted at the rate of about 200 a day, so that the general fear of an excessive outlay of time and labour on the work is probably exaggerated.

GASSNER (G.) & STRAIB (W.). **Experimentelle Untersuchungen über das Verhalten der Weizensorten gegen Puccinia glumarum.** [Experimental investigations on the reaction of Wheat varieties towards *Puccinia glumarum*.]—*Phytopath. Zeitschr.*, i, 3, pp. 215–275, 3 figs., 1929.

Continuing their investigations on the conditions governing infection by cereal rusts [*R.A.M.*, viii, p. 555], the writers conducted a series of greenhouse and field experiments [the results of which are discussed and tabulated] on the reaction towards yellow rust (*Puccinia glumarum*) of a large number of wheat varieties.

The majority of the 536 varieties tested in the greenhouse proved highly susceptible, while a small proportion showed more or less resistance and a few were immune. The German varieties in particular manifested a high degree of susceptibility. To the resistant group belong the following winter varieties: Carsten's Dickkopf V, Krafft's Dickkopf, P.S.G. Hertha, Strube's Neuzüchtung 3186, Svalöf's Panzer III, rote samtige [Red Velvet] einkorn, *Triticum monococcum* var. *hornemannii*, and Clovers red; and

the summer varieties Janetzki's early summer, Aurora (Swedish), Heine's Früher Kolben, Sommer-Igel, and Remy's Chinese I and V. No German variety showed absolute immunity, but this was exhibited by the foreign winter varieties, Modell, Spaulding's Prolific, and de Crépi.

Comparative tests at different temperatures (8° to 12°, 14° to 16°, 18° to 20°, and 20° to 22° C.) showed that, in general, the resistant varieties lose this quality to some extent at the lower ranges—in some cases markedly so. The varieties which were affected in this manner were classed as relatively resistant, while those maintaining their original reaction were termed absolutely resistant.

The results of field observations largely confirmed those of the greenhouse tests, but in several cases considerable differences were apparent in the behaviour of the same varieties under divergent conditions. Thus, Bürckner's Dickkopf, Raecke's Sieghart, and Rimpau's Bastard are resistant in the field, but highly susceptible in the greenhouse even at 20°. Strube's General v. Stocken is moderately susceptible in the greenhouse at 20°, highly so below 20°, and scarcely susceptible in the field. Svalöf's Panzer is highly susceptible in the field, almost immune at high temperatures in the greenhouse, and moderately susceptible at low ones. Horning's summer variety 'Grüne Dame' is resistant in the field and highly susceptible in the greenhouse, even at 18° to 20°.

RUDORF (W.). **Beiträge zur Immunitätszüchtung gegen Puccinia glumarum tritici (Streifenrost des Weizens).** [Contributions towards breeding for immunity from *Puccinia glumarum tritici* (stripe rust of Wheat).]—*Phytopath. Zeitschr.*, i, 5, pp. 465–525, 2 col. pl., 4 figs., 1929.

During the period 1924 to 1928 a series of investigations [the results of which are described and tabulated] was conducted at Halle University to provide a basis for the selection of wheat varieties resistant to stripe or yellow rust (*Puccinia glumarum*) [see preceding abstract].

As a result of inoculation experiments with 25 collections of *P. glumarum* from different parts of Europe on wheat seedlings of some 950 varieties, no clear evidence of the presence of biological races was obtained. Virtual immunity from all these collections was manifested by 12 varieties, including Chinese 165 and 166, emmer from Tzaribrod, Roter Sommerkolben, Blausamtiger Kolben [Blue Velvet Club], Ghirka from Cherson, Hard Taganrog 9 H 39, and Hérisson sans barbes. A high degree of resistance to all was shown by Französischer No. 1, *Triticum monococcum*, and *T. monococcum* var. *hornemannii*. It is noted that the resistant varieties belong to all three wheat groups, i. e., those having 7, 14, and 21 chromosomes [*R.A.M.*, iii, p. 200], the last-named (*vulgare*) predominating.

On the other hand, the outcome of experiments conducted in collaboration with C. W. Hungerford (Idaho) indicated that the biological form of *P. glumarum* occurring in the United States is distinct from that found in Europe. Thus, the Preston, Fultz, Marquis, Dicklow, Red Russian, and Einkorn varieties, which proved immune in America [cf. ibid., iii, p. 266], showed more or

less heavy infection when inoculated with a German strain of the fungus.

The results of various crosses (Chinese 166 × Strube's Dickkopf, Chinese 165 × Panzer II, Kirsche's Stahl × Panzer II and vice versa, &c.), indicated that the resistance is inherited on a Mendelian basis. The infection grade i (no uredosori or spots, only occasional pale dots) of the Chinese 166 variety was inherited as a dominant character in several crosses, resistance being maintained in the F_1 and F_2 generations. The O type infection of Chinese 165 is inherited in a similar manner, but the F_1 plants fell in part into the i type. The F_1 generation of a cross between the semi-resistant Bon Fermier and the susceptible Carsten's V was only partially resistant. Observations on the F_2 generation of various crosses showed that the less pronounced the resistance of the resistant parent, the larger is the number of susceptible plants in the progeny.

BURSTRÖM (H.). **Undersökningar över oorganiska ämnens giftverkningar vid betning av Tilletia tritici sporer.** [Investigations on the toxic action of inorganic substances in disinfection against *Tilletia tritici* spores.]—*Centralanst. för försöksväsendet på jordbruksområdet Medd.* 356, 19 pp., 1929.

The writer describes the technique, and discusses and tabulates the results, of his experiments on the toxicity of a number of inorganic substances towards the spores of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, viii, p. 493]. The spores were germinated in subdued light on filter paper in closed containers at a temperature of 15° to 17° C. [cf. ibid., vii, p. 83]. Forty-two substances (33 metal chlorides or nitrates and 9 acids) were tested in concentrations ranging from n/10 or n/100 in a decadal scale down to n/10,000 or below.

Spore germination was completely suppressed by lithium chloride n/10, copper chloride n/10 and n/100, silver nitrate n/10, n/100, and n/1,000, gold chloride n/100, zinc chloride n/10 (trace), mercuric chloride n/10, n/100, and n/1,000, cerium chloride n/10, n/100, and n/1,000 (trace), 'didymium' chloride n/10, thallium chloride n/10, n/100, n/1,000, and n/10,000 (trace), lead nitrate n/10, arsenic acid n/10, selenic acid n/10 and n/100, hydrogen iodide n/10 and n/100, cobaltous chloride n/10 and n/100, nickel chloride n/10, n/100, and n/1,000, and palladium chloride n/100 (trace).

Although the toxicity of the heavy metals towards *T. caries* spores may be ultimately due to their colloid-precipitating properties, the actual degree of toxicity appears to be linked with some other highly variable factor, probably absorption.

WINKELMANN (A.). **Das Kurznassbeizverfahren.** [The short liquid disinfection process.]—*Illus. Landw. Zeit.*, xlix, 34, pp. 388–389, 1929.

In connexion with a brief survey of the origin and development of the short liquid process for the disinfection of seed-grain, the writer cites some figures relating to the present costs (per 10 cwt.) of the various standard methods of treatment [*R.A.M.*, viii, p. 769]. (1) Immersion of barley against stripe disease [*Helminthosporium*

gramineum] : germisan M. 4·40, uspulun-universal M. 5·09 ; of rye against *Fusarium* [*Calonectria graminicola*], M. 4 and 3·70, respectively ; of wheat against bunt [*Tilletia caries* and *T. foetens*], M. 4·80 and 3·70, respectively. (2) Sprinkling of rye with germisan M. 3 and with uspulun-universal 3·47 ; of wheat with germisan M. 6. (3) Short disinfection process (germisan) for barley, rye, and wheat, M. 6, 4·80, and 4·80, respectively. (4) Dusting of barley with tillantin and ceresan, M. 11·20 and 8·4, respectively ; of rye with abavit B, ceresan, and tutan, M. 5·60, 5·60, and 11, respectively ; and of wheat with abavit B, ceresan, tillantin, and tutan, M. 5·60, 8·40, 8·40, and 11, respectively.

Most of the continuously working dusting apparatus are adaptable to the short liquid disinfection process ; the operation should be carried out as speedily as possible (40 to 60 revolutions per minute). No special apparatus for this process has yet been officially approved by the German Agricultural Society or the Biological Institute.

Nelson (R.). **Wheat scab damages Michigan grain crops.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, xii, 1, pp. 15–18, 1 pl., 1929.

Owing to heavy rains, plant diseases were unusually prevalent and severe in Michigan during 1928, barley and (to a less extent) rye, oats, and wheat being affected to an exceptional degree by scab (*Gibberella saubinetii*). As farmers were obliged to use much scabbed seed, a considerable amount of seedling blight resulted in the 1929 crop, especially in barley and oats, reports being received of plants turning yellow and dying when only a few inches high. Barley was severely attacked and seed barley was frequently of very poor quality. On black awnless barley the perithecial stage of *G. saubinetii*, which is more resistant than the conidial stage to drought and other external influences, was abundantly present, though as a rule very rarely found in Michigan.

As much scabbed seed will probably again be used, recommendations are made for reducing infection as much as possible by the usual sanitary and cultural practices.

Curzi (M.). **Su una 'pseudocarie' delle cariossidi di Frumento.** [On a 'pseudo-bunt' of Wheat caryopses.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, i, pp. 151–155, 2 figs., 1929.

Owing to excessive humidity, premature reaping, or careless storage of the sheaves, wheat between harvesting and threshing is sometimes liable in Italy to abnormal fermentation with a consequent increase in temperature which predisposes it to fungal attack.

In 1926 the author received from the vicinity of Mantua a sample of Ardito wheat so affected ; the reddened caryopses could not be germinated, and a mass of dark spores emerged from the swollen pericarp. Infection was mainly confined to the embryo but sometimes a layer of spores was produced between what remained of the perisperm and the endosperm ; occasionally the aleurone layer was destroyed. Very rarely the starch-bearing

parenchyma was affected, the inside of the caryopsis containing numerous spores, as in bunt infection.

The spores germinated at from 30° to 52° C., with an optimum between 42° and 45°, and gave a hyaline, somewhat filiform, septate, irregularly branched mycelium of uniform hyphae, which formed short, erect, usually simple conidiophores somewhat swollen at the apex or in the middle, and bearing globose, at first smooth, hyaline to olivaceous spores which later became fuliginous or chestnut-brown, measured 8 to 11 μ in diameter, and had a thick, rugose, subreticulate epispore.

The organism is referred to the genus *Acremoniella* and is named *A. thermophila* n. sp., a Latin diagnosis being given.

ROSENSTIEL (K. v.). **Untersuchungen über die Widerstandsfähigkeit von Haferarten und -sorten gegen Haferflugbrand [Ustilago avenae (Pers.) Jens.] und ihre Vererbung.** [Investigations on the resistance of species and varieties of Oats to loose smut of Oats (*Ustilago avenae* (Pers.) Jens.) and its inheritance.]—*Phytopath. Zeitschr.*, i, 3, pp. 317–360, 1 fig., 4 graphs, 1929.

Reed's method of inoculating oats with loose smut (*Ustilago avenae*) [*R.A.M.*, iv, p. 343] was found to be extremely well adapted for specific and varietal susceptibility tests made by the author at Stettin [Pomerania], on account of the high incidence of infection obtained.

The results of the experiments [which are described and tabulated] showed that, generally speaking, spores kept at a low temperature (0° or 5° C.) and atmospheric humidity (50 or 70 per cent.) preserved their infectivity somewhat better than those exposed to ordinary room conditions.

With a collection of spore material from Halle, infection was produced on *Avena ludoviciana*, *A. fatua*, *A. abyssinica*, *A. byzantina*, *A. fatuid*, *A. sativa*, *A. nuda*, and *A. wiestii* (up to 100 per cent. on the three first-named), but not on *A. strigosa*, *A. brevis*, or (in one trial) *A. sterilis*. Each variety was found to comprise strains varying in their reaction to *U. avenae*. The varieties may be classified, according to the degree of infection obtained, as immune (0 to 10 per cent.), resistant (10 to 25 per cent.), moderately susceptible (25 to 75 per cent.), and highly susceptible (75 to 100 per cent.). A series of tests with a number of standard German and foreign varieties of oats showed that most of the German and important Swedish varieties are susceptible to loose smut. The Lischower early variety is immune, v. Lochow's and Pflug's yellow oats highly resistant, Hörning's and Krafft's yellow oats resistant, Streckenthiner II moderately susceptible, and all the other varieties highly so. On the other hand, a number of foreign varieties proved immune or highly resistant. These include *A. amaritta* and La Estanzuela (Buenos Aires), *A. canelosces* (Uruguay), Red Rustproof, Black Mesdag, Iowa Nos. 103 and 106, and Lackton (U.S.A.), Finnischer and Champion aus Kadmar (Finland), and Spelzhafer 5277/23 (Norway). The results of reaction tests on the progeny of crosses between susceptible and resistant varieties of

A. sativa showed that, on the basis of the segregation ratios, inheritance is monomerous, resistance being dominant. No correlation was detected between resistance to *U. avenae* and any other characters.

It is inferred, from a comparative study of inoculated and non-inoculated resistant oat varieties, that the mycelium penetrates the tissues of these as well as of susceptible ones, but that it is unable, in plants of the former type, to proceed to normal fructification.

ARNOLD (O.). **Über das Auftreten von Helminthosporium avenae am Niederrhein.** [On the occurrence of *Helminthosporium avenae* on the Lower Rhine.]—*Deutsche Landw. Presse*, lvi, 37, p. 528, 1929.

Brief notes are given on the brown spots of oats (*Helminthosporium avenae*) [*R.A.M.*, viii, p. 714] at Kempen on the Lower Rhine. The estimated loss caused by the disease was one-fifth to one-quarter of the normal yield. The seed-grain had been treated with tillantin dust. Infection is believed to take place early in the summer and to spread from leaf to leaf. The affected plants were characterized by a number of 'deaf' ears [in addition to the symptoms described in previous papers] for which *H. avenae* is probably responsible in an indirect capacity, though it was not actually found in the ears.

KOSSOBUTZKY (M. I.). Спорынья (**Claviceps purpurea Tul.**) в Вотской Автономной Области в **1926–1928** гг. [Ergot (*Claviceps purpurea* Tul.) in the Votyaks' Autonomous Region in the years 1926 to 1928.]—Pamphlet issued by *Вотская Обл. Станция Защиты Растений и Научное Общ. по Изучению Вотского Края* [*Votyaks' Regional Plant Prot. Stat. and Scient. Soc. for the Study of the Votyaks' Region*], Leningrad, 64 pp., 4 figs., 4 graphs, 1929. [German summary.]

The investigation reported in this paper was undertaken following the serious outbreak of ergotism in the eastern provinces of European Russia in 1926 [*R.A.M.*, viii, p. 304], with the main purpose of elaborating a method for computing the incidence of ergot (*Claviceps purpurea*) in rye fields prior to harvest, which might enable central or local authorities to warn the population against the use of flour prepared from grain with a contamination in excess of that allowed by law (the maximum admixture of ergot sclerotia in rye grain tolerated in the Union of Soviet Republics is stated to be 0·15 per cent.). Extensive data were collected in the Votyaks' Autonomous Region [east Russia] during the three years 1926 to 1928, and were analysed by the variational statistical method [which is fully discussed and illustrated by a number of concrete examples]. The results confirmed the interdependence established by Bakhtin (*Morbi Plantarum*, Leningrad, xiv, 1, pp. 11–17, 1925), of the four factors P (incidence of infected rye plants in the field), Q (incidence of infected ears), D (number of infected spikelets in the ears), and R (contamination of the grain

with sclerotia in percentage of weight). They further showed that the correlations between these factors are of such a high positive order that with the help of certain coefficients it is possible, knowing the numerical value of one factor, to calculate that of the others. It was found, however, that of the two coefficients worked out by Bakhtin, namely, $\frac{P}{R} = K_1$ and $\frac{Q}{R} = K_2$, only the first one is constant [Bakhtin's value for it is 43], while the second varies with the numerical value of Q. The constant values arrived at by the author for K_2 are 15, 12, 9, 6, and 3 for numerical values of Q equal to 1 to 15, 15 to 30, 30 to 50, 50 to 75, and 75 to 100 per cent., respectively.

A distinction is made between the contamination of the grain with sclerotia before harvesting (R_p) and the contamination after threshing (R_o), as it was shown that a fairly large proportion of the sclerotia falls out and is lost during the harvest and transportation of the crop. The first is calculated by means of a complicated formula [which is given], and the second is deduced from the first by means of the formula $R_o = R_p - (q + \alpha)$, where q is the quantity of sclerotia which fall out, and α is the quantity of the rye grain lost prior to threshing (in percentages of weight). It is pointed out that q and α are variable quantities, depending largely on the date of the harvest, the method of reaping, the transportation means, and the like. The value of R_o is of greater practical significance than that of R_p, since it represents the actual contamination of the commercial grain and allows of warning the population of the danger of using flour from grain with excessive contamination. In the author's experience the value of $q + \alpha$ was equal to $\frac{1}{2}R_p$, but this still needs confirmation under conditions different from those under which he worked.

It was proved that the values of D and R_p depend much more on that of Q than on that of P, and it is concluded, therefore, that no useful purpose is to be attained by the establishment of the value of P in general practice.

The results of the investigation also showed that the losses of yield caused by ergot are due not only to the replacement of a number of rye grains by sclerotia, but also to the fact that infection of a spikelet with *C. purpurea* is followed by the sterility of the neighbouring spikelets [cf. ibid., i, p. 170]. The incidence of visibly infected and of sterile spikelets in the ear was shown to be closely interrelated in a regularly ascending progression (from 1 per cent. sterile spikelets for 1 sclerotium, to 21 per cent. for 14 or 15 sclerotia per ear). The disease does not apparently cause stunting of the infected plants or under-development of the grain; in the author's experiments, infected plants frequently appeared to be even more productive than healthy ones.

The control measures recommended are the use of varieties of rye that pass simultaneously through the stages of growth, and suppression of susceptible grasses, especially couch grass [*Triticum repens*] which, under local conditions, is severely attacked by *C. purpurea* and may serve to increase the contamination of the rye grain. There was some evidence that the sclerotia developing on this grass may be even more toxic than those of rye.

Treatment of seed Maize.—*Rhodesia Agric. Journ.*, xxvi, 9, pp. 935–937, 1929.

Laboratory tests in Rhodesia having shown that the treatment of maize seed with tillantin R dust against the so-called *Diplodia* disease [*D. zeae* and *Gibberella saubinetii*: see below, p. 119] increased its germinative power by some 15 per cent. as compared with untreated seed, growers who formerly planted for a stand greater than the optimum (the requisite space being afforded by the failure of some seeds to produce a mature plant) are advised to make allowance for this increase when planting treated seed, as otherwise the thickness of the stands may reduce the yield, and the high percentage of low-yielding plants may increase the cost of harvesting.

Owing to the pungent odour of the treated seed there is little danger of pilferers being poisoned, but every effort should be made to obviate treated and untreated seed being inadvertently mixed.

Hiura (M.). **Studies on some downy mildews of agricultural plants. I. On Sclerospora graminicola (Sacc.), the causal fungus of the downy mildew of Italian Millet (the fourth note).**—Reprinted from *Byochu-Gai Zasshi*, xvi, 9, 5 pp., 1929. [Japanese, with English summary.]

Continuing his studies on the causal organism of downy mildew (*Sclerospora graminicola*) of Italian millet [*Setaria italica*: *R.A.M.*, viii, p. 716], the writer found that the oospores of the fungus from *S. viridis* are capable of producing a very low percentage of infection on *S. italica*. The optimum temperature for oospore germination in *S. graminicola* was found to range between 27° and 30° C., with a maximum at 35°. At the optimum temperature abundant germination occurs within 40 to 48 hours after sowing. The germ-tubes are hyaline, non-septate, branched, and measure 3 to 11 μ in diameter (mostly 3·5 to 5 μ).

Bensaude (M[athilde]). **Note sur le Phytophthora, parasite des Citrus au Portugal.** [Note on the *Phytophthora* parasitic on Citrus in Portugal.]—*Comptes rendus Soc. de Biol.*, ci, 24, pp. 982–984, 1929.

During the two last winter seasons, the writer has observed *Phytophthora hibernalis* [*R.A.M.*, viii, p. 423], hitherto found exclusively on the fruit of citrus in Portugal, also parasitizing both leaf surfaces and causing defoliation. Inoculation experiments with zoosporangia isolated from an orange produced infection on the leaves of an orange seedling kept for 13 days in a moist chamber at a temperature of about 15° C. (nocturnal minimum 7°, maximum 20°). Contrary to Carne's observations, conidia were formed much more profusely on the lower than on the upper surface.

Pure cultures of the fungus from orange and citron [*Citrus medica*] leaves and fruits presented exactly identical characters. On potato agar the mycelium is almost entirely submerged and on oat agar completely so. The most rapid growth occurs at 18° to 20°, the minimum and maximum temperatures for development being 12° and 24°, respectively; the fungus quickly dies between 25° and 26°. In the infected fruits the mycelium is intracellular

in the epidermis and two first layers of the sub-epidermal cells and intercellular in the deeper tissues. In the leaves it is almost exclusively intercellular and subcuticular.

Both in nature and in culture the zoosporangia are borne singly at the apex of slender conidiophores (1 to 2 μ in diameter), and are furnished with a persistent pedicel up to 50 μ in length. They are piriform or elliptical, with a lenticular cap, 1·5 to 2·5 μ in thickness, at the apex. The average dimensions of 50 conidia from orange leaves were 41 by 19·1 μ; extremes 25·2 and 54 by 12·6 and 27 μ; majority 36 to 50 by 17 to 23·5 μ. The corresponding figures for conidia on potato agar were as follows: average 30 by 14·4 μ; extremes 23·4 and 39·6 by 11 and 18 μ; majority 26 to 36 by 14 to 17 μ. For 100 conidia the values were as follows: average 35·5 by 16·7 μ; extremes 23·4 and 54 by 10 and 27 μ; majority 26 to 45 by 14 to 23·5 μ. Oospores were occasionally detected in the subcuticular mycelium of leaves adhering to the tree, and they formed in abundance on fragments of infected leaves in distilled water and on oat and potato agar. Amphigynous antheridia predominated. The average dimensions of 50 oogonia on culture media were 35·17 μ (19·8 and 44 μ), and the exterior diameter of the oospores was generally 3 to 4 μ less than that of the oogonia.

COUTINHO (M. F. P.). **Nova doença nas Tangerineiras.** [A new disease of Tangerines.]—*Bol. Agric. e Econ. da Soc. Corretora Ltda. (Azores)*, v, 4, pp. 1–2, 1929.

An account is given in popular terms of a new disease [the symptoms of which are described] which destroys tangerine orange fruits in the Azores. The condition is attributed to *Pleospora hesperidearum*, in association with *Macrosporium*, *Alternaria*, *Septoria*, and *Epicoccum* spp., the last-named being saprophytic on the tips of the branches. Control is recommended by simple prophylactic measures.

SAVASTANO (G.) & FAWCETT (H. S.). **A study of decay in Citrus fruits produced by inoculations with known mixtures of fungi at different constant temperatures.**—*Journ. Agric. Res.*, xxxix, 3, pp. 163–198, 2 figs., 8 graphs, 1929.

The authors give a full account of their study of the decay produced in lemons and oranges by inoculation with determined mixtures of fungi at different constant temperatures, this method being considered to approximate to the actual conditions in the field, in storage, and in transit. The organisms used in the experiments were *Penicillium italicum*, *P. digitatum*, *Botrytis cinerea*, *Aspergillus niger*, *Sclerotinia libertiana* [*S. sclerotiorum*], *Oospora citri-aurantii*, *Pythiacystis* [*Phytophthora*] *citrophthora*, *Trichoderma lignorum*, *Alternaria citri*, *Phomopsis californica*, *Diplodia natalensis*, and *Dothiorella ribis*.

The results of preliminary experiments with *P. italicum* made for the purpose of ascertaining some of the contributory factors which may cause variations in the rate of decay, indicated that, within certain limits (125,000 to 2 million spores per c.c.), the rate of rotting is not greatly influenced by the density of the spore suspension used as inoculum. No difference in the progress of the

decay was noticed in fruits inoculated 3, 6, or 9 days after picking, but in fruits inoculated soon after picking, the rate of decay was slightly greater. No influence was exerted on the rate of decay by the various constant temperatures (ranging from 9·8° to 31° C.) at which the fruits (lemons) were kept for two weeks previous to inoculation, while lemons held at temperatures alternating from 9·8° to 27·1° every 12 hours showed average rates of decay not far removed from those under constant intermediate temperatures.

The results of the experiments with mixed inocula brought out some striking features, which are briefly summarized as follows: (1) the selective effect of temperature which, in many cases, enables one organism to dominate the others in producing decay; (2) the depressing or accelerating effect of a given mixture on the rate of decay as compared with that produced by the most rapidly growing fungus of the mixture when used alone; (3) the influence of given mixtures on the colour and consistency of the decay; and (4) the difference in temperature range, and in the optimum, maximum, and minimum temperatures of the various organisms for decay during a given time. Thus, a mixed inoculum of *P. italicum* and *P. digitatum* gave increased rates of decay on lemons at the higher and lower ends of the temperature range, and produced a reddish discoloration of the decayed tissue. A mixture containing *A. niger*, *P. italicum*, and *P. digitatum* produced at the lower temperatures higher rates of decay than the highest rate of any one of the fungi alone. As a rule, *B. cinerea* appeared to have a depressing effect at low and intermediate temperatures; *A. niger* accelerated the rate of decay at intermediate and high temperatures, while *O. citri-aurantii* seemed to have an accelerating effect at nearly all the temperatures tested.

Bally (W.). **Nieuwe wortelschimmels bij Koffie.** [New root fungi on Coffee.]—*De Bergcultures*, iii, 65, pp. 1669–1675, 6 figs., 1929.

A semi-popular account is given of the occurrence of the following fungi on coffee roots in Java. Besides the brown root disease (*Fomes lamaoensis*) [*R.A.M.*, viii, p. 202], which is the most widespread root rot on coffee in Java, and the black root rot (*Xylaria thwaitesii*), fructifications of which have recently been found on *Hevea* rubber and coffee [see below, p. 130], there is a third parasite, *Rosellinia bunodes*, which has been observed to cause a form of black root rot that is responsible for heavy damage to coffee, rubber, lamtoro [*Leucaena glauca*], *Crotalaria*, and *Indigofera endecaphylla*. The symptoms of this disease and life-history of the causal organism, perithecia of which have been found on coffee, rubber, and lamtoro stems, are fully described [ibid., i, p. 95; iii, p. 480]. A species of *Septobasidium* believed to be distinct from *S. rubiginosum* [see above, p. 91] occurs on coffee, *Centrosema pubescens*, *Vigna oligosperma*, *I. endecaphylla*, and *L. glauca*.

Boyd (O. C.). **Ascochyta blight of Cotton.**—*Plant Disease Reporter*, xiii, 6, pp. 88–89, 1929. [Mimeographed.]

The cotton crops in South Carolina and northern Georgia have suffered heavy damage during the current season from the blight

due to *Ascochyta gossypii* [*R.A.M.*, v, pp. 599, 722; cf. also vii, p. 763]. In Oconee County, South Carolina, all the 25 fields inspected contained some infected plants (100 per cent. in one case showed leaf or stem lesions, with 4 per cent. dead). In Haversham County, Georgia, the losses from seedling blight and destruction of the tops of older plants ranged from 10 to 50 per cent. Leaf spots and cankers were prevalent on the new growth replacing the blighted shoots. The disease is reported to have accompanied and followed a protracted rainy period ending about 10th July.

King (C. J.) & Loomis (H. F.). **Cotton root-rot investigations in Arizona.**—*Journ. Agric. Res.*, xxxix, 3, pp. 199–221, 17 figs., 1929.

Continuing their study of cotton root rot (*Phymatotrichum omnivorum*) at Sacaton, Arizona [*R.A.M.*, v, p. 426], the authors state that experiments conducted from 1925 to 1927, inclusive, showed that the spread of the disease to fresh areas may be effectively controlled by saturating the soil with a 2 per cent. solution of cresylic acid or a 1 in 100 solution of formaldehyde, while carbon bisulphide proved to be ineffective. Cotton sown on the experimental plots six days after treatment appeared to be only little affected, although germination was somewhat slower on the plots disinfected with cresylic acid.

Further experiments with stable and other organic manures confirmed the results previously reported: a plot which had 65·6 per cent. of its area infected in 1922, was entirely free from the disease in 1927 after five years of manuring; and another plot, 71·7 per cent. of which was infected in 1922, showed only 0·03 per cent. infection after seven years manuring. The treatment was also effective in delaying the appearance of the disease and the injury caused by it. It was further observed that the manured plots served as effective barriers in limiting the advance of *P. omnivorum* mycelium from adjacent control plots.

There was evidence, however, that continuously infected areas may in time be broken up into isolated infection centres, or even be almost entirely freed from infection without the influence of any cultural treatment. Thus, a plot which in 1925 was almost 100 per cent. infected, began to improve in 1926, and in 1927 the dead plants were widely scattered over it, except towards the extreme ends. In another plot, the infection diminished from nearly 70 per cent. in 1919 to 1 per cent. in 1927.

The mycelium was found to be capable of passing under an open trench 20 in. deep. Conidial mats of *P. omnivorum* [a description of which is given] were frequently observed in areas where no dead plants existed, but they appeared to be associated with buried fragments of decaying roots. Observations on the location of the disease on the same plots over a number of years indicated that infected spots may disappear for a period of several years, and then recur as isolated centres of infection and progress as before.

Inoculation of the roots of healthy cotton plants in plots free from the disease gave successful infection, but attempts to infect cotton plants growing in large tanks or drums by inserting in the latter large cylinders of infected soil gave negative results.

In describing cultural experiments with *P. omnivorum* on various kinds of roots and other media, the authors state that it may exist in nature as a saprophyte and may be able to live in the soil for many years in the absence of living roots [ibid., viii, p. 641].

Chorine (V.) & Baranoff (N.). **Sur deux champignons parasites d'Anopheles maculipennis Mg.** [On two fungi parasitic on *Anopheles maculipennis* Mg.]—*Comptes rendus Soc. de Biol.*, ci, 25, pp. 1025–1026, 1929.

Some larvae of *Anopheles maculipennis* (a vector of malaria), captured near Zagreb [Jugo-Slavia], were found to be parasitized by a fungus belonging to the Saprolegniaceae which was isolated and cultured on Sabouraud's medium. Ten larvae placed in water in a container with one dead insect covered with the fungus contracted the disease and died within three days. Another closely related fungus, isolated from the larvae of *Simulium* (*Odagmia ornatum*) in the same locality, was also found to be capable of infecting *A. maculipennis*, but less severely than the foregoing. Infection takes place by means of zoospores.

Kater (J. McA.). **Note on the structure of a Monilia isolated from a case of psoriasis.**—*Univ. of California Publ. in Bot.*, xiv, 10, pp. 301–306, 1 pl., 1 fig., 1928.

The author describes the morphological and cytological characters of a species of *Monilia*, considered to be a variety of *M. psilosis*, isolated by Dr. M. S. Fleisher from the skin scrapings of a patient suffering from psoriasis [*R.A.M.*, viii, p. 644].

The fungus forms yeast-like budding cells and also hyphae, which form branches at the apical end of the cells. These may remain as yeast-like buds or they may elongate and produce filamentous side branches. The basal cell of the primary hyphae always retains its oval shape and the apical cell is generally somewhat clavate. Binucleate and tetranucleate yeast-like cells are occasionally found in ten-day-old cultures, while the terminal cells of a hypha may also contain four nuclei. This tetranucleate condition of yeast-like cells closely resembles the approach to ascospore formation in *Saccharomyces*.

Berde (K. v.). **Das Verhalten von Fadenpilzkolonien unter der Wirkung des Lichtes.** [The behaviour of Hyphomycete colonies exposed to the action of light.]—*Arch. für Dermatol.*, clviii, 1, pp. 35–50, 8 figs., 1929.

The writer's cultural experiments [which are fully described] with *Microsporon audouini*, *Achorion schoenleini*, *Sporotrichum beurmanni*, and *Oidium albicans* on maltose agar showed that the first three make the best growth in total darkness, whereas the last-named is apparently unaffected by light of varying intensity. The shape of the colonies of *M. audouini* and *A. schoenleini* was markedly modified by the various types of illumination used in the experiments. Thus the former, exposed to the rays of a quartz lamp, developed deep, radial folds which were absent from cultures kept in direct sunlight. *A. schoenleini*, under the action of blue or colourless incandescent bulbs, developed pale, spreading, zonate

colonies resembling those of *Trichophyton cerebriforme* and differing completely from the normal compact, yellowish-brown, homogeneous growth.

Massia (G.) & Rousset (J.). **Les microspories et les trichophyties du cuir chevelu chez l'adulte.** [Microsporoses and trichophytoses of the scalp in adults.]—*Ann. de Dermatol.*, Sér. VI, x, 8, pp. 828–844, 2 figs., 1929.

The writers review (from contemporary literature) 19 cases of trichophytosis and 3 of microsporosis, and comment on the comparative rarity of this condition in adults, which they attribute to the inhibitory action of the internal secretions. They further describe a case of ringworm, due to *Microsporon lanosum*, in a 13-year-old girl, who had been in contact with infected dogs and a cat [*R.A.M.*, viii, p. 575]. The disease spread from the girl to her mother. *M. lanosum* is stated to be prevalent in the neighbourhood of Lyons, where the authors' examination was carried out.

Akagi (S.). **Über eine neue mykotische Hautkrankheit 'Trichosporia cutis psoriatiformis progressiva Asahi et Akagi'.** [On a new mycotic skin disease 'trichosporia cutis psoriatiformis progressiva Asahi et Akagi'.]—*Japanese Journ. of Dermatology*, xxix, 8, pp. 733–774, 10 figs., 1929. [Japanese, with German summary on pp. 53–55.]

Clinical details are given concerning a hitherto undescribed skin disease, occurring in the Fukuoka district of Japan, which the author names 'trichosporia cutis psoriatiformis progressiva'. Of the four cases described (three of which were in infants), all but one were fatal. The disease is characterized by the development of an eruption extending over all parts of the body and accompanied, in the later stages, by gastric disturbances and fever. The fungus isolated from infected material was compared morphologically and physiologically with allied forms and was considered to differ sufficiently to justify the establishment of a new species, *Trichosporon asahii*. One patient was successfully cured by injections of an auto-vaccine.

Norrie (F. H. B.). **Rhinosporidium infection of the nose.**—*Journ. of Laryngology and Otology*, xliv, 8, pp. 505–513, 1929.

Clinical details are given of five cases (one in a woman) [see next abstract] of *Rhinosporidium* infection of the nose [*R.A.M.*, viii, p. 647] occurring in Bengal, where the frequency of this disease among the author's total ear, nose, and throat cases during seven years was approximately 1 in 1,925.

The characteristic spores [of *R. seeberi*; ibid., iii, p. 154] were found in the affected tissues in every case. The anterior part of the nose appears to be the chief site of infection, the tumours evidently arising in the mucous membrane and remaining confined to it, without involving the underlying tissue. The mode of infection is not known, but the presence of spores in the nasal discharge before and shortly after the removal of the tumours suggests that

the fungus enters from outside. No case of recurrence after the excision of the tumours has been observed.

CHERIAN (P.) & VASUDEVAN (A.). **A case of rhinosporidiosis in the female.**—*Journ. of Laryngology and Otology*, xliv, 8, pp. 518–519, 2 pl. (1 col.), 1929.

Rhinosporidiosis is generally stated to be confined to the male sex, but in March, 1928, the authors investigated a case of this disease in a 33-year-old woman from the Malabar district of Madras [see preceding abstract]. Microscopical examination of the diseased tissues revealed sporangia [of *Rhinosporidium seeberi*] measuring up to 200 μ in diameter, the centre of which was occupied by large, spherical spores, sometimes containing nuclei. The younger stages of the fungus consist of large cells (40 μ) with vacuolated protoplasm and a central nucleus with a distinct nucleolus. The youngest cells measure only 8 to 10 μ.

MORGAN (G. F. V.). **Moulds in unsalted Butter. Research at Wallaceville Laboratory.**—*New Zealand Journ. of Agric.*, xxxix, 1, pp. 38–46; 2, pp. 106–113; 3, pp. 174–179, 14 figs., 1929.

This is a semi-popular account of an investigation at the Wallaceville Laboratory, New Zealand, on six moulds that are stated to be chiefly responsible, besides bacteria and yeasts, for the deterioration of unsalted butter destined for export, namely, *Penicillium glaucum*, *Stemphylium* sp., *Fusarium lactis*, *Oidium lactis*, *Cladosporium herbarum*, and *C. butyri*. Brief accounts are given of the distribution of the organisms in the butter factories, their morphological, biological, and cultural characters, and of the injury caused by them to butter. It is pointed out that while spores of all the six species named are capable of germinating in a few days at temperatures between 12° and 13° C., and *P. glaucum*, *O. lactis*, and the *Stemphylium* are able to germinate and grow in butter in from four days to two weeks after removal from cold storage, the remaining three moulds only germinated after the lapse of not less than a month from thawing, when they had been kept for two or three months at cold storage temperatures. This point should be borne in mind when culturing samples of butter for the detection of moulds, since it was shown that spores of moulds that require a long time to germinate after thawing will not germinate any sooner in pure culture. It was also found that the spores of the moulds retain their viability in water for several months, with the exception of *F. lactis*, which failed to germinate after three days' immersion in water. Most of the moulds germinated in a medium containing 6 or 7 per cent. of salt and the fact that salt in butter is not taken up by the fat but remains in the water of the butter indicates the necessity of computing the salt percentage of salted butter in biological tests on the basis of the concentration of salt in the butter-water, and not in the total bulk of the butter. All the moulds tested also proved to be highly resistant to high temperatures and to the action of disinfectants, such as formalin and limewash. The best culture media were

found to be Czapek's agar for *P. glaucum*, *F. lactis*, and *Stemphylium* sp., and malt agar for the other three species.

In a separate table are given details of the activity in butter of the moulds studied as compared with that of bacteria, and recommendations, based on the author's studies, are made for the prevention of contamination of butter in the factories.

DIDDENS (HARMANNA). **De Ascochyta-ziekte van het Vlas.** [The *Ascochyta* disease of Flax.]—*Tijdschr. over Plantenziekten*, xxxv, 9, pp. 251–253, 1929.

Young flax plants in Zeeland (Holland) were attacked in May, 1928, by a foot rot caused by *Ascochyta linicola* Naoumoff & Vassilievsky [*R.A.M.*, viii, p. 106]. The typical bicellular spores, measuring 9·2 by 2·8 μ, were accompanied by large numbers of unicellular *Phoma*-like ones, 5·9 by 2·3 μ. It is not yet certain whether the latter are identical with those of the fungus referred to *Phoma* isolated by Gentner from Bavarian flax seed [ibid., iii, p. 273], or with various other species of the latter genus that have been recorded on flax in different countries, but in any case a careful study of these forms is desirable in order to trace the exact relationships of the injurious *A. linicola*.

PAPE (H.). **Fleckenkrankheit des Rittersporns.** [Spot disease of Larkspur.]—*Gartenwelt*, xxxiii, 31, pp. 430–431, 1 fig., 1929.

Larkspur (*Delphinium*) leaves are frequently attacked in Germany by the leaf spot due to *Bacillus* [*Bacterium*] *delphinii* [*R.A.M.*, iv, pp. 9, 469, 480; vi, p. 165]. The intensely black, irregularly angular spots, measuring 0·5 mm. to 2 cm. in diameter, are distributed over the entire leaf surface, mostly delimited by the veins and sometimes merging into one another and producing large necrotic areas. In severe cases the affected leaves fall prematurely or they may be more or less stunted if attacked at an early stage. The stalks and inflorescences are also sometimes infected and show some degree of malformation. In cases of heavy infection the flower buds become black and dry and are unable to open; the seed capsules may also be attacked and seed formation disorganized. Probably the causal organism is perpetuated by means of the seed from diseased capsules.

Some observations on varietal susceptibility to *Bact. delphinii*, made near Berlin in August, 1928, showed that Carnegie is highly susceptible, Queen Wilhelmina and others moderately so, and 18 varieties (including King of Delphiniums and Mevrouw De Kat) immune or extremely resistant. *Bact. delphinii* probably overwinters in or on the soil and in old, infected foliage. The latter should be collected and burnt and severely affected plants cut down to the ground. Young plants should be repeatedly sprayed with a standard fungicide.

ESBJERG (N.). **Forsøg med Rentabiliteten ved Sprøjtning af Æbletraeer. I.** [Experiments on the economics of spraying Apple trees. I.]—*Tidsskr. for Planteavl*, xxxv, 4, pp. 517–565, 1929. [English summary.]

A detailed account, accompanied by numerous tables, is given of

five years' investigations on the economic aspects of spraying apple trees in Denmark [cf. *R.A.M.*, viii, p. 653]. Bordeaux mixture was used as follows: 2 per cent. in 1924–5; 2 per cent. quicklime: 1 per cent. copper sulphate in 1926; and 1 per cent. quicklime: 0·5 per cent. copper sulphate in 1927–8. Lime-sulphur was used throughout at the rate of 2·5 per cent. (30° B.). Four or five applications were given.

Both sprays resulted in a heavy increase of first-class fruit. Bordeaux mixture gave the best control of canker (*Nectria ditissima*) [*N. galligena*: ibid., vii, p. 676], scab [*Venturia inaequalis*], and *Monilia* [*Sclerotinia fructigena*: ibid., v, p. 559], but it caused severe damage to the fruit of susceptible varieties, e. g., Cox's Orange Pippin, especially in wet, cold seasons. Lime-sulphur was less effective in the control of diseases and caused leaf scorch in several varieties, so that the yield was somewhat reduced in comparison with that of the Bordeaux-treated trees. On the other hand, the fruit from the trees sprayed with lime-sulphur was superior, showing little trace of injury and therefore fetching higher market prices than the Bordeaux-treated apples.

Bitter pit in Apples—a confirmation of conclusions.—*Journ. Australia Council Sci. & Indus. Res.*, ii, 3, p. 187, 1929.

In February, 1929, apples destined for export from Western Australia were tested by the iodine method [*R.A.M.*, viii, p. 252] for susceptibility to bitter pit and pronounced immature and likely to become badly affected in transit. This decision was questioned by some of the growers concerned, who placed a number of the rejected cases in cold storage, opening them early in April when, if despatched, they would have reached London. The fruit was then severely pitted, and a subsequent examination showed that over 90 per cent. of the larger apples and over 70 per cent. of the smaller ones were affected.

Howitt (J. E.). **Cherry leaf spot and Apple scab.**—*Sixtieth Ann. Rept. Fruit Growers' Assoc. of Ontario, 1928*, pp. 46–50, 1929.

Popular notes are given on the symptoms, life-history, and control of cherry leaf spot [*Coccomyces hiemalis*], which was widespread and destructive throughout Ontario in 1928 [*R.A.M.*, viii, p. 354]. The following spray schedule is recommended: (1) Bordeaux mixture [concentration not stated] with 1½ lb. lead arsenate or 1 lb. lime arsenate when most of the husks are off; (2) 10 to 12 days later, as under (1); (3) 10 to 12 days after (2), lime-sulphur 1 in 40, plus 3 lb. hydrated lime and 1½ lb. lead arsenate or 1 lb. lime arsenate.

Under Ontario conditions, the critical period for apple scab [*Venturia inaequalis*] infection is from the time the blossom clusters are pushing upwards in the bud until about a fortnight after petal fall [cf. ibid., viii, p. 353]. The calyces or sepals are often the seat of 70 per cent. of primary infection. The following spray schedule is recommended: (1) early leaf and pre-pink, Bordeaux mixture 3–6–40 or lime-sulphur 1 in 40; (2) pink, lime-sulphur 1 in 40, plus 3 lb. hydrated lime and 1½ lb. lead arsenate

or 1 lb. lime arsenate: (3) calyx (immediately after the fall of all or nearly all the blossoms), as under (2); (4) small apple (about 12 days after calyx application), lime-sulphur 1 in 50. This spray may be repeated in early August (before 15th) if the weather is very damp and cool. Fairly good results may be obtained by the use of an 8 ft. rod with two disk nozzles at a pressure of 150 lb., but a pressure of at least 200 lb. is necessary to ensure efficient work with a single spray gun, while a double one needs 250 to 300 lb.

KOTTE (W.). **Kombinierte Schädlingsbekämpfung im Obstbau.** [Combined pest control in fruit growing.]—*Nachricht. über Schädlingsbekämpf.*, iv, 2, pp. 49–57, 7 figs., 1929.

In connexion with a general discussion on the value of the combined control of fungous diseases and insect pests in German orchards, the writer states that good control of apple scab (*Fusicladium*) [*Venturia inaequalis*] was given by the copper- and arsenic-containing preparation, nosprasen [cf. *R.A.M.*, vii, p. 382].

THOMAS (M.). **The production of ethyl alcohol and acetaldehyde by Apples in relation to the injuries occurring in storage. Part I. Injuries to Apples occurring in the absence of oxygen and in certain mixtures of carbon dioxide and oxygen.** —*Ann. of Appl. Biol.*, xvi, 3, pp. 444–457, 1 pl., 1929.

In this account of his investigations into the poisoning of Newton Wonder apples by the products of zymasis during storage the author points out that hitherto the physiological diseases of apples have been distinguished from one another mainly by the different incidence of injuries and the variations shown in their subsequent extension. These differences and variations are indicated by the names given to the diseases, such as superficial, deep, or soft scald, internal breakdown, and brown heart. Such terms are not, however, altogether satisfactory, as the same injuries may be produced under quite different storage conditions; thus, injuries arising in the epidermis and progressing inwards, often referred to as deep or soft scald, have been reported as occurring in air stores at low temperatures, in anaerobic stores at all temperatures, and in stores containing mixtures of carbon dioxide and oxygen. The author, accordingly, considers that it would be preferable in describing physiological diseases to use terms that indicate the nature of the discoloration and at the same time suggest some distinctive internal physical or chemical circumstance which either causes or can be correlated with the disorganization of the cells which precedes discoloration.

Zymasis does not occur in healthy apples stored in atmospheres free from carbon dioxide and containing more than 5 per cent. oxygen, but it begins when the external oxygen concentration falls below some value between 1 and 5 per cent., and resembles that which takes place in the absence of oxygen. This anaerobic zymasis is characterized by a relatively high accumulation of ethyl alcohol (more than 0·3 per cent.), and a small accumulation of acetaldehyde (never more than 0·006 per cent.) within the tissues. In apples stored in 100 per cent. nitrogen, the ratio of ethyl alcohol

to acetaldehyde is usually greater than 50 to 1. Injuries to, and the death of, the cells of the apple generally accompany these metabolic changes if anaerobic conditions are maintained long enough. The incidence of this injury at the surface and its regular progress inwards are ascribed to the different susceptibility of the cells of apples to the adverse effects of anaerobic zymasis.

In gas mixtures containing carbon dioxide and oxygen the apples undergo carbon dioxide zymasis, this process beginning either immediately or after a lapse of time, according to the concentration of the carbon dioxide, and being usually followed by 'internal aldehyde poisoning' when the concentration of acetaldehyde formed is greater than 0·01 per cent., and by 'invasive aldehyde poisoning' when it is greater than 0·03 per cent. Not more than 0·08 per cent. of ethyl alcohol is found in apples showing either form of poisoning, and the ratio of ethyl alcohol to acetaldehyde is 2 to 1. These injuries are caused by the acetaldehyde, and their incidence in different parts of the apples is due to the different susceptibility of the cells to this substance. If, however, the concentration of carbon dioxide is less than (approximately) 13 per cent. and the concentration of oxygen is less than normal, zymasis does not take place, the storage life of the apples being, apparently, prolonged. When the concentration of carbon dioxide is between 13 and 20 per cent. the type of internal browning known as brown heart sometimes appears, but whether this is a form of internal aldehyde poisoning has not yet been ascertained.

The author considers that it may be possible in the future to diagnose invasive alcohol poisoning and internal and invasive aldehyde poisoning by determining the ethyl alcohol and acetaldehyde content of suspected apples, even many days after the injury developed, as neither ethyl alcohol nor acetaldehyde is oxidized by apple cells, nor do they escape rapidly from the fruit. Any evidence of zymasis would indicate that ventilation during storage had been inadequate.

Rice (W. H.). **Control of brown-rot in stone-fruits. The Henderson experiments with Peach-trees, 1925–29.** — *New Zealand Journ. of Agric.*, xxxix, 2, pp. 97–100, 1929.

A brief account is given of experiments which were conducted from 1925 to 1929, inclusive, at Henderson, New Zealand, in the control of brown rot (*Sclerotinia cinerea*) [*S. americana*: *R.A.M.*, vii, p. 252; viii, p. 254] of peaches. The summer sprays tested, after the first application of Bordeaux mixture, included lime-sulphur either alone or in combination with atomic sulphur, atomic sulphur, sulpho, and a special make of lime-sulphur locally known as 'dry-mix' [loc. cit., but it is recommended to dissolve the casein in the caustic soda solution before adding water]. None of these sprays gave effective control of the bud, blossom, and twig rots induced by *S. americana*, but the incidence of the summer rot of fruits was considerably reduced by all, and more particularly by dry-mix (in the 1927–8 season the plot sprayed with this preparation had only 0·5 per cent. infected fruit, as against 40 per cent., which is the usual average loss of crop due to this form of the disease).

Taken as a whole, the results of these experiments are considered to indicate that brown rot in peaches can be controlled by strict sanitation of the orchards, and by summer applications of the dry-mix preparation (a schedule for which is appended). A feature of these applications is that the foliage of the sprayed trees is retained in exceptionally good condition.

BERKELEY (G. H.). **The brown rot of stone fruits.**—*Sixtieth Ann. Rept. Fruit Growers' Assoc. of Ontario, 1928*, pp. 50–54, 1929.

A popular account is given of the symptoms and life-history of brown rot of peaches and other stone fruits [*Sclerotinia americana*: *R.A.M.*, viii, p. 354] with recommendations for its control in Ontario. It has been found during the last two years that a pre-blossom application of sulphur dust or lime-sulphur increases the control of peach brown rot by some 75 per cent.

BERKELEY (G. H.). **Black knot of Plums and Cherries.**—*Sixtieth Ann. Rept. Fruit Growers' Assoc. of Ontario, 1928*, pp. 54–55, 1929.

The results of field observations and laboratory examinations have shown that, under Ontario conditions, the spores of plum and cherry black knot [*Dibotryon morbosum*: *R.A.M.*, viii, p. 128] mature about the 18th to 25th February, ejection probably taking place early in March. All prunings and other diseased material should therefore be removed from the orchards before the middle of February. Infection from these early spores produces little or no swelling during the current season, but in the following year (about May) a dull brown canker appears, covered with summer spores. This growth develops into a black gall which in turn gives rise to the above-mentioned early spores. The gall or knot further contains a perennial mycelium which can only be destroyed by the excision of the affected branch four or five inches below the gall.

GARD (M.). **Pourridié et carbonate de chaux.** [Root rot and carbonate of lime.]—*Comptes rendus Acad. des Sciences*, clxxxix, 14, pp. 497–498, 1929.

The author states that his investigation of the composition of the soils in different parts of France, in which fruit trees and the vine suffer from root rots (*Armillaria mellea* on plums, and *Rosellinia necatrix* and *Pilacre pallida* on the vine), showed that such soils are very poor in carbonate of lime (from 0 to 13·2 per cent. at the highest). This confirms the opinion he expressed in a previous paper [*R.A.M.*, vii, p. 686] that a deficiency of carbonate of lime in the soil is the chief factor which predisposes the cultivated walnut to attacks of *A. mellea*.

JØRGENSEN (C. A.) & WEBER (ANNA). **Undersøgelser over Hindbær-Stængelsyge.** [Investigations on Raspberry cane blight.] —*Tidsskr. for Planteavl*, xxxv, 4, pp. 582–614, 10 figs., 1929.

A comprehensive account is given of the writers' investigations

on the etiology, biology, and control of cane blight, a major disease of raspberries in Denmark which has hitherto received scanty attention.

The symptoms of the disease are described [*R.A.M.*, ii, p. 128; viii, p. 184; and below, p. 133]. The following fungi were isolated from over-wintered one-year-old canes (mostly of the Marlborough variety): *Didymella applanata, Diaporthe rostellata, Hendersonia rubi* [ibid., vi, p. 740], *Coniothyrium fuckelii* var. *rubi, Diplodina pallor, Fusarium herbarum* [ibid., vii, p. 700], *Botrytis* sp., *Cytospora clypeata*, and an undetermined species of *Fusarium*, the two last-named found on raspberry canes at and near Lyngby. The perithecia of *Didymella applanata* develop during the winter on infected canes, appearing as small, evenly distributed black dots, $\frac{1}{4}$ to $\frac{1}{5}$ mm. in diameter, on the silvery parts of the cortex. Small black pycnidia are formed in older cultures and produce unicellular, bacilliform, hyaline pycnospores measuring 5 to 7 by 2·5 to 3 μ. A pure culture from a single ascospore yielded identical pycnidia and pycnospores, which were determined as belonging to a species of *Phoma* distinct from *P. idaei* [ibid., vi, p. 739], *P. herbarum* [ibid., v, p. 343], *P. ruborum*, and *P. vepris*. Thus the imperfect stage of *D. applanata* is definitely proved to be a *Phoma*. The writers agree with Karthaus [ibid., vi, p. 739] that *Mycosphaerella rubina* is identical with *D. applanata*, the supposed absence of paraphyses in the former being in all probability due to an oversight.

Coniothyrium fuckelii var. *rubi* (of which the ascigerous stage, *Leptosphaeria coniothyrium*, has never been found in Denmark) is not of very frequent occurrence. The dark, thin-walled, globular pycnidia, $\frac{1}{6}$ to $\frac{1}{3}$ mm. in diameter, may be observed in the outermost layer of the cortex of the canes during the greater part of the year.

H. rubi, which is often found on raspberry canes in association with the foregoing, is characterized by the development in the cortex of groups of pycnidia, about $\frac{1}{3}$ mm. in diameter, with projecting apices; the cylindrical-clavate, triseptate conidia measure 18 to 20 by 8 μ; the apical cell is hyaline and the other three brownish-grey.

The *Botrytis* isolated from diseased canes is stated to be undoubtedly distinct from *B. cinerea*, but no fructifications were produced in pure cultures and therefore a closer investigation was impossible.

F. herbarum was only isolated once; it is characterized by orange- to cinnamon-coloured sporodochia and conidia measuring 55 by 4 to 5 μ, generally 5-septate.

Inoculation experiments were carried out with these five fungi on young shoots of the susceptible Goliath and Superlative varieties, the mycelium or spores being inserted through wounds. Positive results were given only in the case of *D. applanata* and *C. fuckelii* var. *rubi*, of which the former, in view of its extended distribution, must be regarded as the main cause of cane blight in Denmark.

The most important source of infection is the conidial (*Phoma*) stage of *D. applanata*. The spots on two-year-old, fruit-bearing

canes and young shoots are partly due to direct infection, occurring chiefly in August, and partly to the earlier invasion of the leaves and petioles, from which the fungus spreads to the canes. These observations were confirmed by inoculation experiments on wounded and unwounded material. Diseased plants sustain two forms of injury: many of the buds are killed during the winter months and produce no flowering shoots (though they may appear externally healthy), and numerous flowering and fruiting canes and shoots are weakened or wither prematurely, with a resulting loss of berries. Towards the autumn the extension of the lesions is arrested, and the general darkening even of the healthy areas renders them inconspicuous. Later the spots assume a silvery tinge, due to the formation of small air-filled cavities between the epidermis and the collapsed cortical cells. The mycelium appears to be confined to the cortex of the young shoots and the hyphae are always intercellular. The protective layer of cork and bark covering the canes in the autumn is very liable to crack and split in the diseased areas. It was impossible to trace the stages leading from cane infection to the withering of the shoots in the following spring. It is certain, however, that the latter feature is a consequence of the previous season's infection and not of a fresh attack.

In order to prevent the introduction of the fungus into new plantings, only one-year-old shoots should be used. The incidence of infection in existing plantings may be reduced by the removal of the old shoots before the beginning of August, or as soon as possible after the berries are picked. A series of experiments has been instituted to determine the value of spraying in the control of cane blight. In addition to the above-mentioned varieties, Stedsebaerende [Everbearing] fra Feldbrünnen has been found highly susceptible, Søholt, Hornet, Harzjuwel, and Baumforth's Seedling moderately so, while two strains of Fajstrup and Kejserinde Dagmar (a cross between Fajstrup and Superlative) are very resistant.

ROTTA (G.). **La parola di un competente sul solfato di rame.** [The word of an expert on copper sulphate.]—*Rivista Agricola*, xxv, 569, pp. 391–393, 1929.

After a brief historical account of the discovery and early use of copper sulphate, the author states that in 1894 England exported 36,000 tonnes [1 tonne = 1,000 kg.] of the metal while the Italian production amounted to only 3,000 tonnes, this, however, being brought up to 8,000 tonnes five years later. In 1913 Italy produced 48,000 tonnes, and this figure continued to rise until, in 1926, Italy was the largest producer in the world with an output of 95,000 tonnes as compared with 40,000, 35,000, and 15,000 tonnes, respectively, for England, France, and the United States [cf. *R.A.M.*, viii, p. 658]. At present Italy produces some 110,000 tonnes annually, all of which, apart from some 2,000 or 3,000 tonnes used in various industries, is employed for fungicidal purposes.

Brief notes are also given on the manufacturing processes adopted and on the prices prevailing during recent years.

H[OPKINS] (J. C. F.). **Mycological notes. I. Seed treatment for Maize against Diplodia. II. Seed treatment for Tobacco against bacterial diseases.**—*Rhodesia Agric. Journ.*, xxvi, 8, pp. 793–797, 1929.

When two lots of maize seed, one slightly affected with the seedling blight and ear rot known in Rhodesia as 'Diplodia' [but usually covering both *Diplodia zeae* and *Gibberella saubinetii*: *R.A.M.*, viii, p. 772 and above, p. 105], the other being apparently healthy, were dusted with tillantin R and planted in germinators, some of the seeds in each lot being left untreated as controls, the treated seeds gave, respectively, 37 and 66 per cent. increase of germination over the untreated. Numerous other tests with different varieties of maize seed in all stages of infection gave similar results. As the chief source of infection lies in old maize trash, this must be destroyed, but seed treatment more than repays its cost by the increased yield that results from it. Directions are given for the construction and use of a simple barrel duster.

After stating that silver nitrate has been found a better disinfectant of tobacco seed against angular leaf spot [*Bacterium angulatum*] and wildfire [*Bact. tabacum*] than either formalin or mercuric chloride [cf. *R.A.M.*, v, p. 138], the author points out that it is rapidly oxidized by light and air, and any trace left on the seed is converted to a harmless compound unable to injure the germinating seedlings. The treatment recommended consists in dissolving 17·5 grains of silver nitrate crystals per quart of cold water, soaking the seed for 15 minutes, washing repeatedly, and then spreading it out to dry on a cloth. Rapid drying is essential; blotting or brown paper may be used, if the seed is occasionally moved by hand. Every care must be taken to avoid subsequent contamination.

BERNÁTSKY (J.). **Bevezetés a növenykórtan elemeibe.** [Introduction to the rudiments of phytopathology.]—320 pp., 103 figs., Budapest, Athenaeum Publishing Co., 1929.

In this little book (stated to be the first manual of phytopathology in the Hungarian language) a summary is given of the scientific principles and practical application of the science. There are sections on ecology and the action of external factors on plants, and notes on practical agriculture, horticulture, and forestry. The common diseases of the principal economic plants of Hungary (except fruit and the vine, which are discussed in other treatises by the author) are described, with recommendations for their control. Many of the illustrations are original.

FISCHER (E.) & GÄUMANN (E.). **Biologie der pflanzenbewohnenden parasitischen Pilze.** [Biology of the plant-inhabiting parasitic fungi.]—xxi + 429 pp., 71 figs., 2 diags., 29 graphs, Jena, G. Fischer, 1929.

In this comprehensive survey of the biological or, more accurately in their opinion, the ecological conditions governing the relations between parasitic fungi and their hosts, the authors discuss the principal factors underlying the two main divisions of their subject, namely, (1) the essentials for the development of the

parasitic relationship, and (2) the course of the latter after its establishment.

Section (1) is sub-divided into three chapters dealing, respectively, with the prerequisite conditions for infection (*a*) on the part of the host, (*b*) on that of the parasite, and (*c*) in the encounter between parasite and host. The factors discussed in the chapter relating to the essentials for infection on the part of the host comprise natural or constitutional susceptibility and resistance, the influence of external conditions on inherent resistance and susceptibility (predisposition), and the passive and active factors of susceptibility and resistance, the former involving resistance and the latter immunity. The second chapter deals with the innate variations in aggressiveness of the parasitic fungi, the modifications of natural aggressiveness under the influence of different external conditions, and the factors governing the power of aggression. The chapter concerned with the encounter between parasite and host describes the various modes of preservation and dissemination of the fungus (vegetative and reproductive), the opportune moment for the establishment of the relationship between the two organisms, and the appropriate environmental conditions for contact.

Section (2) is sub-divided into four chapters dealing, respectively, with the attack of the parasite on the host (the inception of the infective process); the development of the vegetative phases of the fungus in the plant; the production of the fructifications of the parasite; and the action of the parasite on the host. In the chapter relating to the inception of infection the following concepts are discussed: natural or genotypic variations in the attack of the fungus on the host; variations in the mode of attack induced by environmental conditions; and the factors determining the invasion of the host by the fungus. In chapter 2 the development of the vegetative phases of the fungus within the host is discussed under the headings of the mode of occupation of the plant, and the distribution of the mycelium in the host. Chapter 3 deals with the time, sequence, morphological peculiarities, and localization of the different types of fructification. In chapter 4 the action of the parasite on the host is discussed under the following aspects: period of development of the effects exerted by the fungus on the plant (incubation period), and nature of such effects on the organs, metabolism, chemistry, growth, and other functions of plant life. Each chapter in both sections is furnished with a bibliography of the relevant literature.

MERKEL (L.). **Beiträge zur Kenntnis der Mosaikkrankheit der Familie der Papilionaceen.** [Contributions to knowledge of the mosaic disease of the family of the Papilionaceae.]—*Zeitschr. für Pflanzenkrankh. (Pflanzenpath.) u. Pflanzenschutz*, xxxix, 8–9, pp. 289–347, 12 figs., 1929.

The symptoms of mosaic disease on beans (*Phaseolus vulgaris*), peas, sweet peas (*Lathyrus odoratus*), broad beans (*Vicia faba*), clovers (*Trifolium* and *Melilotus* spp.), lucerne, *Anthyllis vulneraria*, and yellow lupins (*Lupinus luteus*) are fully described from the writer's own observations as well as those recorded in contemporary literature [cf. *R.A.M.*, vii, pp. 658, 659]. The different

types of mosaic are schematically represented and shown in tabular form. They comprise sprinkle (in which the leaves are dotted with irregular patches independent of the veins), vein mosaic [ibid., vii, p. 134], mottling (characterized by the development of chlorotic areas in the intercostal spaces, especially of *Phaseolus* leaves), and pock mosaic (in which dark green protuberances of irregular extent develop on the pale green leaves). Although no sharp line of demarcation can be drawn between the various types of mosaic, each form is primarily adapted to certain hosts, pock mosaic occurring mostly on beans (*P. vulgaris*) and lupins, mottling on peas and clover, and vein mosaic on sweet peas. Sprinkle is less strictly specialized than the foregoing; sometimes this type is associated with mottling.

Experiments in the transmission of mosaic from diseased to healthy plants by means of expressed sap or tissue emulsions gave uniformly negative results. On the other hand, infection was transmitted by *Aphis fabae* from *P. vulgaris* to *V. faba* and lupins; by *Macrosiphum pisi* from peas to *P. vulgaris*, sweet peas, red clover (*T. pratense*), and lupins; by *M. pisi* from sweet peas to *P. vulgaris* and lupins; by *A. fabae* and *M. pisi* from *V. faba* to *P. vulgaris*, sweet peas, *Anthyllis vulneraria*, *T. pratense*, *T. hybridum*, *T. repens*, *T. agrarium*, *Melilotus altissima*, and lupins; by *M. pisi* from *T. pratense* to *P. vulgaris* and peas; by *A. fabae* and *M. pisi* from lupins to peas, sweet peas, and *V. faba*; by *M. pisi* from peas to sweet peas and *T. pratense*; by *M. pisi* from sweet peas to peas and *T. pratense*; and by *M. pisi* from *T. pratense* to peas and *V. faba*. The results [which are tabulated] of all these tests lead the author to the conclusion that one and the same virus is responsible for the mosaic symptoms of all the Papilionaceae examined.

The disease was found to be transmissible by the seed in clover and other perennial Papilionaceae. Observations on the insect vectors showed that the virulence of the infective principle declines with the continued absence of the aphids from the neighbourhood of diseased plants. No evidence of the transmission of infection through winter eggs was obtained.

The [tabulated] results of three years' observations on the reaction to mosaic of 60 standard varieties of *P. vulgaris* showed that 17, including Unerschöpfliche, Weisse römische Wachs, Weisse Wachs Brech, Doppelte Prinzess (stringless), Holländische Schwert, and Wachs Flageolet (white and red), were highly susceptible; three were immune, namely, Langschotige Neger (stringless), Allererste weisse Treib, and Hinrichs Riesen Wachs; and the remainder intermediate.

DUFRÉNOY (J.). **Réaction de cellules à la pénétration de suçoirs.** [Cell reaction to the penetration of haustoria.]—*Phytopath. Zeitschr.*, i, 5, pp. 527–531, 11 figs, 1929.

Peculiar callosities have recently been observed by Foëx and Rosella in Moroccan barley plants infected by *Helminthosporium sativum* [*R.A.M.*, ix, p. 29] and in wheats attacked by a species of *Alternaria*. The cytological study of barley seedlings artificially inoculated with *H. sativum* showed that the haustoria are

enveloped in a sheath staining vividly with haematoxylin, which in turn is surrounded by a zone of cytoplasm staining red with the reagent of Milon-Denigès or erythrosin. Near the haustoria the vacuolate cytoplasm generally forms a network of trabeculae abundantly supplied with mitochondria undergoing division [cf. ibid., ix, p. 51].

Similar phenomena may be perceived in the spiciform shoots of hops infected by *Pseudoperonospora humuli* [ibid., ix, p. 59]; the cytoplasm of the mycelium also forms a network of trabeculae containing numerous mitochondria between rounded vacuoles, which may assume the filamentous aspect characterizing Golgi's apparatus in hyphae particularly rich in proteids. The extremely slender haustoria of this fungus may ramify in the cytoplasm of the host cell without inducing any reactions susceptible of microchemical observation. Generally, however, they are surrounded by a thickening which stains red with the reagent of Milon-Denigès, so that the haustoria are in a region of the host cell rich in soluble proteids resulting from an active proteolysis.

TAKATA (R.). **Vitamin-B content of the polished Rice 'koji'.**—*Journ. Soc. Chem. Ind.*, Japan, xxxii, pp. 626–627, 1929. [Abs. in *Brit. Chem. Abstracts* (*A*), p. 1344, November, 1929.]

The contents of growth-promoting and antineuritic vitamins in the koji prepared from polished rice on which *Aspergillus oryzae* is grown [*R.A.M.*, viii, p. 507] were determined by feeding experiments on young rats and pigeons. The rats fed with 76 per cent. of the koji as the sole source of these vitamins grew somewhat below the normal rate for three months, at the end of which their weight began to decrease; the animals fed with 76 per cent. of polished rice died within two months. The pigeons fed with 78 per cent. of the koji died in 30–41 days, showing the symptoms of polyneuritis, while those fed on polished rice succumbed in 23–35 days. Since the polished rice, which constitutes the raw material of the koji, is devoid of vitamin B, it is inferred that *A. oryzae* can synthesize this substance.

MERKENSCHLAGER (F.). **Zur Biologie der Kartoffel. II. Mitteilung. Zur Pathologie der Blattrollkrankheit.** [On the biology of the Potato. Note II. On the pathology of the leaf roll disease.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xvii, 4, pp. 345–376, 11 figs., 1929.

A comprehensive account, accompanied by tables, is given of the writer's investigations (conducted with the collaboration of M. Klinkowski) on the pathology of potato leaf roll.

The actual process of rolling is defined as a pathological accentuation of a normal function, induced by modifications in the water balance of the plant. The number of stomata functioning in diseased plants is very greatly reduced in comparison with the normal, and the resulting differences of tension in the leaf bring about the actual rolling. The mechanical explanation of the process must be sought in the anatomy of the leaf. An extensive spongy parenchyma underlies a one-layered palisade tissue. The cells of the leaf tip have already reached maturity while those of

the base are still undergoing division. This results in the development of 'tension fields' [Spannungsfelder] which must either be equalized or intensified according to the degree of atmospheric humidity, the stage of growth of the leaf, and the available water supply. Rolling cannot take place at all stages in the development of the leaf. There are certain phases in which the leaf tends either to curling or rolling, and there is also a transitional stage between these two pathological manifestations.

True leaf roll may be distinguished, in its early stages, from apical rolling, and that associated with soil acidity [*R.A.M.*, vi, p. 633 ; vii, p. 341 ; viii, p. 395], by the fact that affected plants may recover. Only with the onset of unfavourable weather conditions for the potato does the normal tendency to leaf rolling assume a definitely pathological character. Once this stage is reached the various types of leaf roll can no longer be differentiated with certainty.

Some general observations are made on the relation between leaf roll and the constitution of the plant, the composition of the soil, and climatic influences, while the concluding section of the work deals with the history of the research on this disease. The author finds it difficult, if not impossible, to accept the view that leaf roll is due to a virus.

SMITH (K. M.). **Studies on Potato virus diseases. VI. Further experiments with the virus of a Potato mosaic upon the Tobacco plant.**—*Ann. of Appl. Biol.*, xvi, 3, pp. 382–399 4 pl., 1 diag., 1929.

Further experiments [details of which are given] on the transmission of potato mosaic to tobacco, in which four separate strains of the ring spot form were passed through successive generations of tobacco plants, showed that the virulence to tobacco of all the strains became markedly increased by this means so as to cause necrosis and even the death of young plants [cf. *R.A.M.*, viii, p. 521]. In the most virulent stage no rings form but large necrotic patches, or the leaf may collapse and die before the patches appear.

When such a virulent ring spot form was transmitted from tobacco to healthy potato plants either by needle inoculation or by means of the aphid *Myzus persicae* both methods produced an intensified form of mosaic, but only that induced by the needle was often fatal. A similar comparison of needle with aphid (*M. persicae*) inoculations of healthy tobacco plants from a tobacco plant affected with the virulent ring spot form showed that whereas the needle reproduced the virulent form of the disease, the aphid caused a mottling and dark green line disease, apparently identical with that produced by aphid transmission from the ordinary type of ring spot.

An analysis of a comprehensive comparative series of aphid and needle inoculations of tobacco with potato mosaic and tobacco ring spot indicated that the aphid-induced disease is a constant, infectious virus, and that the aphid does not transmit the more lethal characters of the disease.

Of the White Burley, Virginia, Kentucky, Maryland, Havana, and Connecticut tobaccos, Virginia was the most and White Burley

the least, resistant to needle inoculations with the virulent form of the virus, the susceptibility of the remaining varieties approximating to that of White Burley.

Some 500 seedlings were grown from seed derived from 12 Virginia and White Burley plants affected either with the ring spot or aphid-induced form of the disease, but all remained healthy.

The leaves of six White Burley seedlings were needle-inoculated with an inoculum made from the roots of a tobacco plant affected with the virulent form of the virus ; ten days later all developed the normal, virulent type of disease, thus demonstrating that the virus is present in the roots of affected plants. Conversely, when the roots of six healthy White Burley plants were inoculated with an inoculum made from a leaf of a tobacco plant affected with the virulent form of the virus, in 14 days all the plants developed the virulent type of disease.

It was found that certain individual Virginia and White Burley plants appear to possess an inherent resistance which attenuates the virulent virus, needle inoculations of these plants producing only weaker symptoms with a return to the ring spot form ; when the juice from these was passed on into other tobacco plants the virus still gave rise to weak symptoms, as compared with those produced by the same strain of virus before its passage through the resistant plant.

Preliminary attempts to produce experimentally in tobacco plants an immunity from the virulent form of the virus, by inoculation with a suspension of the virus killed by heating, failed. When naturally resistant individual plants which had developed only a mild mosaic after inoculation with the virulent virus, and also when plants infected by the weaker type of virus by means of aphids or inoculated with a virus attenuated by mixture with alcohol, were reinoculated with the virulent virus, the normal, virulent form of the disease appeared in all cases. Double inoculation evidently can destroy the natural resistance, and inoculation with a weak virus confers no immunity against subsequent inoculation with the virulent form.

Tubers taken from potato plants infected the previous year with the ring spot form were grown in order to study the behaviour of the virus after a winter passed in the resting tuber; the plants which developed showed all the symptoms of the intensified mosaic characteristic of infection with tobacco ring spot that were exhibited by the parent plants the year before. This suggests that the change induced in the virus of a potato mosaic by passing through tobacco may be permanent.

MARTIN (MARY S.). **Additional hosts of Synchytrium endobioticum (Schilb.) Perc.**—*Ann. of Appl. Biol.*, xvi, 3, pp. 422–429, 2 pl., 1929.

An account is given of experiments conducted by Glynne's 'green wart' method [*R.A.M.*, iv, p. 501] to test the susceptibility of various Solanaceous plants to *Synchytrium endobioticum*. Confirmation was obtained of the susceptibility of tomato, *Solanum nigrum*, and *S. dulcamara*, and the following new host species were successfully inoculated: *Nicandra physaloides*, *S. nodiflorum*,

and *S. villosum*. On most of the hosts a definite warty outgrowth developed, but in others the fungus, though in the tissues, showed little or no external sign of its presence. Plants grown in contaminated soil remained unaffected.

CHEAL (W. F.). **Experiments on the cause of Potato sickness.**—*Gard. Chron.*, lxxxvi, 2225, pp. 132–133, 6 figs. [3 on pp. 134–135], 1929.

Pots of soil obtained from 'potato sick' land [*R.A.M.*, viii, pp. 629, 738] in the Boston area of Lincolnshire were sterilized and heavily inoculated in 1928 and 1929 with *Corticium solani* and the eelworm, *Heterodera schachtii*. They were planted with tubers of the highly susceptible Eclipse variety (previously immersed for 1½ hour in 0·1 per cent. mercuric chloride) and kept out-of-doors. In 1928 the results of the experiments were inconclusive. In 1929 the inoculated plants made little growth and developed symptoms identical with those shown in extreme cases of potato sickness; they died at the end of June. In a test in which one lot of pots was inoculated with *C. solani* and the other with *H. schachtii*, the plants in the latter series died in the middle of July, while those in the former remained apparently healthy for 8 or 9 days longer.

LEACH (J. G.), JOHNSON (H. W.), & PARSON (H. E.). **The use of acidulated mercuric chloride in disinfecting Potato tubers for the control of Rhizoctonia.**—*Phytopath.*, xix, 8, pp. 713–724, 5 graphs, 1929.

A detailed account is given of a series of experiments, conducted at two places in Minnesota from 1926–8, to determine the efficacy of Cunningham's acidulated mercuric chloride method in comparison with various standard treatments for the control of *Rhizoctonia* [*Corticium*] *solani* on potato tubers [*R.A.M.*, vi, p. 115]. Better results were given by five minutes' immersion in a cold solution of mercuric chloride (1 in 500), with the addition of 1 per cent. by volume of commercial hydrochloric acid, than by the hot formaldehyde method, the former being approximately as effective as the standard mercuric chloride two-hour soak. After treating seven successive lots of fairly dirty tubers in the acidulated solution only 17·7 per cent. of the mercuric chloride and 12·2 per cent. of the acid were lost. None of the organic mercury compounds used in the tests proved effectual in the control of *C. solani*.

SCHLUMBERGER [O.]. **Der gegenwärtige Stand der Schorffrage.** [The present status of the scab question.]—*Pflanzenbau*, vi, 2, pp. 33–39, 1929.

A study of the literature [which is briefly summarized] on the occurrence of potato scab (*Actinomyces scabies* and other species) in Germany shows that the disease is widely distributed, especially in the sandy soils of the eastern districts. The author's observations suggest that different varieties of potatoes are attacked by different forms of *Actinomyces* rather than that each of the latter can cause a particular kind of scab [cf. *R.A.M.*, i, p. 183]. Of the four possible methods of control, viz., seed treatment, soil disinfection, manuring, and the selection of resistant varieties, only

the last-named has hitherto given any definite promise of success. A list of recently tested susceptible and resistant varieties is given [ibid., viii, p. 595].

PENMAN (F.). **'Glassy end' of Potatoes.**—*Journ. Dept. Agric. Victoria*, xxvii, 8, pp. 449–459, 2 pl., 1 graph, 1929.

During the harvesting of the 1927–8 potato crop reports were received from numerous localities in Victoria of a condition referred to as 'glassy top' associated with a high proportion of 'second growth' (i.e., long or irregularly shaped tubers). Affected tubers when cut showed a translucent area, almost invariably at the stem-end, darker than the normal flesh. The extent of the affected tissue varied widely, sometimes covering nearly the entire tuber. In tubers showing second growth the aftergrowth portion was seldom affected.

The glassy areas were found to have a very high water and low starch content and an abnormal proportion of reducing sugars, the glassy appearance being attributed mainly to the absence of starch.

The condition is considered to result from the removal of carbohydrate from the affected areas to furnish material necessary for excessive second growth in other parts of the plant, due to unusual weather conditions. Under ordinary conditions glassy end is not amenable to control, but it is suggested that varieties should be bred which show a minimum proportion of second growth tubers.

WEIR (J. R.). **Annual Report 1928 including initial period beginning June, 1927. Pathological Division.**—*Ann. Rept. Rubber Res. Inst. Malaya, 1928*, pp. 61–95, 1929.

An account is given in popular terms of the isolation treatment of Keuchenius [*R.A.M.*, iv, p. 310] for the control of brown bast of *Hevea* rubber, the author stating that the effectiveness of the method depends upon a regular, careful inspection of the tapping cut and the accuracy with which the affected bark is isolated. The method may be modified by beginning the exploration channel 2 in. below the tapping cut, the cut to the wood being made on the right and left to join the tapping cut with the channel, in order to prevent loss of latex and allow the channel to heal before the cut reaches it. In special cases scraping or stripping the isolated area may be used in conjunction with the isolation system [cf. ibid., viii, p. 57]. Stripping the bark alone [ibid., i, p. 144] is seldom to be recommended as many trees so treated again develop the disease, recurrence appearing to be commoner in stripped trees than in those treated by any other method. In Malaya stripping, on the whole, proved rather disastrous: brown bast reappeared, excessive wounding occurred, with bark infections of various kinds, while the period of renewal necessary was also found to be too great.

The following rubber parasites were recorded on catch crops: *Fomes lignosus* on coffee, tea, kapok [*Eriodendron anfractuosum*], tapioca, oil palm, coco-nut, and gambier [*Uncaria gambier*], *F. lamaoensis* on the first three of these hosts, and *Ganoderma pseudoferreum* on oil palm.

A special investigation [an account of which is given] was made in Johore into a die-back of the terminal branches of mature *Hevea* rubber which is present on certain types of soil throughout Malaya. No fungus was found that was capable of attacking the upper crown branches under normal conditions, and the disease is considered to be directly attributable to debility or under-nourishment coupled with adverse soil conditions and exposure.

In discussing the nomenclature of some Polyporaceae on rubber, the author prefers the name *G. pseudoferreum* to *F. pseudoferreus* [cf. ibid., v, p. 54]. With regard to *F. lignosus*, it is stated that the original material on which Klotzsch based this name is in the herbarium at Berlin; this material, as well as a specimen from the type collection sent by Klotzsch to Fries, a part of which is in the author's collection, is identical with the common fungus of rubber in Malaya known as *F. lignosus*. Spores are present in Fries's specimen. These, as well as other microscopical details, including consistency of tissues, are the same as are found in the Malayan and American collections, and therefore the name *F. lignosus* should stand [cf. ibid., viii, p. 72].

Studies under controlled and uncontrolled conditions of the parasitism of *F. lignosus*, *F. lamaoensis*, and *G. pseudoferreum* are stated to have shown that the first-named is strongly parasitic and can cause the death of six months-old rubber without the supplementary action of any other organism.

F. lamaoensis, originally described from the Lamao river, Luzon (Philippine Islands), and the cause of brown root rot of rubber, was found on nearly all the estates visited in Malaya and is regarded as a much more serious cause of decay than was formerly believed. In four instances it caused a serious decay in the branch forks of rubber, resulting in the breakage of the branches at this point. These infections were due to wind- or insect-borne spores. The spore-producing capacity of the fungus, as determined by spore print tests, is great and may continue indefinitely, but the fructifications are usually rapidly destroyed by insects. The mycelium can extend through the soil to a distance of 16 in. from a major infection, and attack neighbouring mature roots.

A good deal of leaf disease was observed in *Hevea* rubber nurseries during the period under review, *Helminthosporium* [*heveae*: ibid., ix, p. 64] being the commonest cause; mites are usually associated with the fungus.

Oidium [*heveae*] was discovered on the young flush of rubber leaves, in several localities, always in association with the mite *Tarsonemus latus*. This appears to be the first record of *O. heveae* in Malaya, where, so far, very little damage has been caused.

It was found that mouldy rot is not always due to the same organism but may be produced by the combined activities of several; thus, *Sphaeronema*, *Fusarium*, *Diplodia*, *Aspergillus*, and *Penicillium* spp. were found on a single mouldy tapping cut.

Rhizoctonia bataticola [*Macrophomina phaseoli*], not previously reported from Malaya, was isolated from the roots of *Hevea* rubber; the parasitism of the fungus was tested under controlled conditions, with negative results.

Xylaria multiplex, *X. plebeja*, and *X. deserticola* were found on

the dead wood of living *Hevea* rubber, frequently following wounds caused by sun scorch, fire, or mechanical means; they were sometimes associated with *Ustulina* [*zonata*] in the same canker.

Cuttings of *Hibiscus* and *Erythrina* were inoculated with *Sphaerostilbe repens* and planted in sterile sand. After four months the fungus had grown vigorously over the surface of the dead wood, the callus region, and the new roots, but had not invaded the living tissues. Some of the cuttings were artificially weakened and later the callus and roots of these became invaded, but the others grew vigorously and became permanently established although the fungus remained present on the dead parts. *S. repens* is evidently not parasitic in the ordinary sense, attacking only under certain external or environmental conditions which may have reduced the vigour of the host.

Two stem diseases of rubber were recorded for the first time in Malaya. In one, soft velvety coatings were found on the stems of seedlings in wet situations, these being the fructifications of *Septobasidium bogoriense*; the other disease, the cause of which was not determined, is recognizable by a series of concentric grooves in the bark of mature trees; the affected bark flakes off but the vital tissues apparently remain unaffected. The trees are very conspicuous in that they appear to be covered with carvings. The condition is known as ring rot disease in Java [ibid., v, p. 582].

PUNT (C. D.). **Meeldauwbestrijding met zwavel middels het Björklund verstuivingsapparaat.** [Mildew control with sulphur by means of the Björklund dusting apparatus.]—*De Bergcultures*, iii, 63, pp. 1611–1613, 1929.

Details are given of the writer's recent experiments in the control of rubber mildew [*Oidium heveae*: *R.A.M.*, ix, pp. 55–57] in the Malang district of Java by means of the Björklund motor dusting apparatus. The total area covered by the operations was 2,580 acres and the quantity of sulphur used amounted to 75,000 kg. (20 tonnes in the form of dust and 55 tonnes of sulphur sludge). The cost of the sulphur was Fl. 6142·50 and that of the benzine, oil, and coolies' wages Fl. 765·21, making a total of Fl. 6907·71 (Fl. 2·68 per acre). The trees receiving this treatment remained perfectly healthy and gave an excellent yield.

The average area of level ground treated in nine hours is 180 bouw [1 bouw = 0·71 hect.], while on hilly ground 225 bouw may be covered in the same time. One apparatus is sufficient for 1,000 acres, two are necessary for 2,000 to 3,000, and three or more for larger plantations. Objections are frequently raised to the high price of the dusting machines, but the writer has this year purchased two for Fl. 250, a figure that compares favourably with Fl. 2,500 expended in previous seasons on the excision of dead wood after leaf fall. The Björklund apparatus is constructed of sheet-iron, which is considerably cheaper than the aluminium used for the more expensive machines.

Sludge containing 65 per cent. sulphur costs Fl. 73·50 per tonne, and dust (95 per cent.) Fl. 105; the former is preferred by the writer as less inflammable than the dust.

Brief notes are given on the Platz and Sulfia apparatus [loc. cit.].

Van Heusden (W. C.). **Enkele mededeelingen over de meeldauwbestrijdingsproeven bij 's Lands Caoutchoucbedrijf in 1928.** [Some notes on the mildew control experiments at the Government Rubber estate in 1929.]—*De Bergcultures*, iii, 65, pp. 1665–1668, 1929.

Excellent results in the control of mildew [*Oidium heveae*] have been obtained in a number of plantations forming part of the (Java) Government Rubber Estate by dusting with sulphur at the rate of 20 kg. per hect. [see preceding abstract]. The estimated cost of the treatment, including wages, benzine, oil, &c., is Fl. 3 per hect. The Sulzer motor apparatus (Winterthur, Switzerland) worked efficiently in these tests.

Bobilioff (W.). **Enkele beschouwingen over moderne methoden van bespuiten en bestuiven bij het bestrijden van plantenziekten.** [Some observations on modern methods of spraying and dusting in the control of plant diseases.]—*De Bergcultures*, iii, 65, pp. 1662–1665, 1929.

An account is given of the writer's recent visits to Holland, Switzerland, and Germany, in the course of which a number of apparatus suitable for dusting rubber against mildew [*Oidium heveae*: see preceding abstracts] were inspected. The eventual application in the Dutch East Indies of the most up-to-date European and American methods of combating plant diseases is discussed with special reference to the urgent problem of rubber mildew.

Bally (W.). **Twee zwarte wortelschimmels van Hevea (Rosellinia bunodes (B. & Br.) Sacc. en Xylaria thwaitesii Cooke).** [Two black root fungi of *Hevea* (*Rosellinia bunodes* (B. & Br.) Sacc. and *Xylaria thwaitesii* (Cooke).]—*Arch. voor Rubbercult. Nederl.-Indië*, xiii, 8, pp. 431–447, 3 pl., 6 figs., 1929. [English summary.]

A *Hevea* rubber tree on an estate interplanted with coffee and lamtoro (*Leucaena glauca*) on Mt. Semeru (south Java) was found in February, 1929, to be attacked by *Rosellinia bunodes*, not previously reported to occur on this host. The fungus had killed a number of the coffee and *Leucaena* trees.

The white (later black) mycelium extended up the stem of the infected rubber trees to a distance of about 10 cm. above soil level. It penetrated the wood through the bark and caused distinctly visible black streaks in the medullary rays. Both perithecia and coremia developed above the root-collar. A characteristic feature of the asci (apparently not hitherto described in tropical species of the genus) is the presence, near the top, of a thickened membrane, intersected by a very narrow median canal, which stains dark blue with iodine. The coremia are black structures, 1 to 2 mm. in length, composed of twisted hyphae, spreading outwards like a fountain and bearing minute, oblong conidia (4 to 6 by 2 μ) on their topmost lateral branches, where a white spore layer may be visible to the naked eye. This type of fructification was also found on the diseased coffee and *Leucaena* trees.

The differences between *R. bunodes* and *R. arcuata* [*R.A.M.*, vii,

p. 65] are summarized. The perithecia of the latter are smooth and measure 1·5 to 2·4 mm. in diameter, while those of the former are rough and about 1·5 mm. in diameter; the mycelium of *R. arcuata* forms white, star- or fan-shaped strands at the juncture of the bast and wood, while *R. bunodes* produces only black dots. The ascospores of the two species are quite distinct.

The rubber tree observed by the author was in an advanced stage of decay, but the earlier stages were investigated on coffee and *Leucaena*. The root-collar and the upper part of the taproot were sometimes completely rotted, while the lateral roots remained quite healthy. In some cases the stems were girdled just above soil level, giving the impression of insect injury. Infection above ground appears to be disseminated largely by the spores.

Pending further investigations, the control of *R. bunodes* should be based on the eradication and destruction of infected material, and care in the selection of green manures, among which *Indigofera endecaphylla* and *Crotalaria anagyroides* have been found susceptible to the attacks of the fungus.

In another plantation the writer observed the fructifications of *Xylaria thwaitesii* on a lateral root of a rubber tree simultaneously infected by *Rigidoporus microporus* [*Fomes lignosus*: ibid., viii, p. 266 and above, p. 127]. A description of the fructification and spore characters of *X. thwaitesii* is given.

Bertus (L. S.). **A sclerotial disease of Mucuna pruriens DC.**—*Trop. Agriculturist*, lxxiii, 2, pp. 74–77, 1 pl., 1929.

A brief description is given of a severe outbreak in 1928 of *Sclerotium rolfsii* in a plot of *Mucuna pruriens* at the Experiment Station of Peradeniya, Ceylon, where the plant was being grown as a possible cover crop in rubber plantations. Subsequent inoculation experiments showed that both *M. pruriens* and *M. nivea* are highly susceptible to *S. rolfsii* at all stages of their development, a fact which should be borne in mind when growing these plants on rubber estates. The fungus was also shown to be capable of attacking full-grown plants of roselle (*Hibiscus sabdariffa* var. *altissima*) and the green leaves of ginger.

Rayllo (A.). **Beiträge zur Kenntnis der Boden-Pilze.** [Contributions to the knowledge of the soil fungi.]—*Centralbl. für Bakt.*, Ab. 2, lxxviii, 24–26, pp. 515–524, 8 figs., 1929.

This is a condensed account of the author's investigations on the soil mycoflora of three widely separated districts of European Russia, a fuller version of which has already been noticed [*R.A.M.*, viii, p. 60].

Salmon (E. S.). **Twelfth report on the trial of new varieties of Hops, 1928.**—*Journ. Inst. of Brewing*, N.S., xxvi, 11, pp. 523–532, 1929.

A severe attack of mosaic disease occurred in 1928 in the hop gardens of the East Malling Research Station, 83 hills of 'commercial' varieties being affected and 15 of 'new' ones, the latter represented by OF 27, CC 28, G 10, X 77, and Z 41 [*R.A.M.*, viii, p. 61]. Among the possible agents of transmission are the aphid,

Phorodon humuli, and the eelworm, *Heterodera schachtii*, while the operations of stripping the vines and cutting the hills may also facilitate the spread of infection. The significance of the discovery of symptomless carriers of the disease [ibid., viii, p. 808 and next abstract] is emphasized. Carrier varieties should not be planted in the vicinity of Golding or other susceptible varieties, but they may safely be grown near Colgate and Fuggles. Scions of the latter variety grafted on a severely diseased plant or on carriers remain perfectly healthy and make normal growth.

MACKENZIE (D.), SALMON (E. S.), WARE (W. M.), & WILLIAMS (R.). **The mosaic disease of the Hop; grafting experiments, II.** —*Ann. of Appl. Biol.*, xvi, 3, pp. 359–381, 1929.

When scions of hop varieties susceptible to mosaic [cf. *R.A.M.*, viii, p. 60] were grafted on apparently healthy German, Danish, English, and Seedling varieties they developed typical mosaic in a number of cases, whence it appears that carrier varieties are common among commercial hops; certain male hops were also found to be carriers. In a few cases susceptible scions grafted on carrier stocks remained healthy. As a rule the carriers showed no trace of mosaic, but one carrier variety (Red Vine Canada) in one season showed nascent or 'masked' symptoms. Scions of the commercial variety Fuggles grafted on carrier plants invariably remained healthy.

It is stated that the only method of transmission of hop mosaic that has been demonstrated is by grafting, but that it is abundantly clear that the disease spreads by some other means in hop gardens.

KIRSCHNER (R.). **Die Blattrollkrankheit des Hopfens.** [The leaf roll disease of Hops.]—*Biologia Generalis*, Vienna, v, p. 225, 1929. [Abs. in *Fortschr. der Landw.*, iv, 21, pp. 699–700, 1929.]

The primary cause of the so-called leaf roll disease of hops in Czecho-Slovakia is stated to be excessive manuring, especially with nitrogen, but abnormally dry conditions are essential to the development of the symptoms. Affected plants are characterized by a remarkably low yield.

STELL (F.). **Sugar-cane mosaic in Trinidad.**—*Internat. Sugar Journ.*, xxi, 368, pp. 414–415, 1929.

In this review of the sugar-cane mosaic situation in Trinidad [cf. *R.A.M.*, i, p. 192; ii, p. 394; iii, p. 382; vii, p. 305] the author states that the only immune varieties grown are Uba and its allies; the standard canes are B.H. 10 (12) and B. 156. At present the disease is not serious owing to the short ratooning period (a fourth ratoon being seldom grown) and to the scarcity of the insect vector *Aphis maidis*. The chief cause of dissemination is the planting of infected cuttings.

Systematic roguing has been conducted at the Government Experiment Station, where the disease was first reported in the island in 1920, one boy working over 84 acres once a fortnight now being considered sufficient. The percentage of infected stools has been

reduced from 7·64 in 1920–1 to only 0·004 in 1927–8. The cost was $2.70 per acre at the start of the operations but should be under 50 cents during the current year.

Davis (R. L.). **Java-Barbados hybrids in Porto Rico.**—*Planter and Sugar Manufacturer*, lxxxiii, 5, pp. 83–85, 100; 6, pp. 103–104; 7, pp. 123–125; 11 figs., 1929.

P.O.J. 2725 × S.C. 12/4 seedlings which were found free from mosaic at Mayaguez, Porto Rico, for three crop seasons, during which time they were interplanted with mosaic-infected Java 36, as a rule failed to develop a single case of mosaic when planted elsewhere in heavily infected fields of B.H. 10 (12). No mosaic was found in the hybrid canes of this cross known as Mayaguez nos. 3, 4, 7, 14, 31, 39, 42, 51, 52, 53, 62, 77, and 100. Mosaic inspections were made on nos. 3, 4, 7, and 14 at Anasco, and on nos. 42, 51, 52, and 53 at Hormigueros and Guayanilla; not one infected cane was found although B.H. 10 (12) was infected in all three localities. Preliminary tests indicate that similar results are obtained when P.O.J. 2725 is crossed with B.H. 10 (12).

It is concluded that mosaic resistance amounting to immunity may be secured from selection among seedlings containing only one-eighth part Kassoer blood [cf. *R.A.M.*, viii, p. 133]. Immunity is transmitted from the P.O.J. 2725 parent, when this cane is crossed with S.C. 12/4 or B.H. 10 (12). There is also transmitted from the P.O.J. side an extremely rapid early growth and a strong stooling power, superior in both these respects to the Barbados male parents.

P.O.J. 36 M released for general distribution.—*Planter and Sugar Manufacturer*, lxxxiii, 6, p. 117, 1929.

Formal announcement has been issued by the United States Department of Agriculture of the release of the sugar-cane variety P.O.J. 36 M for general distribution and commercial planting in Louisiana after 15th September, 1929. The P.O.J. canes 36, 213, and 234 have already been so released; all four varieties are tolerant of mosaic and resistant to root disease.

Cook (M. T.). **The eye spot disease of Sugar-Cane.**—*Planter and Sugar Manufacturer*, lxxxiii, 6, pp. 101–102, 1929.

The information contained in this paper on the eye spot disease of sugar-cane *Helminthosporium sacchari* [*H. ocellum*: *R.A.M.*, viii, pp. 134, 740] has already been noticed from an earlier paper by the same author [ibid., vii, p. 199].

Lee (A.). **The toxic substance produced by the eye spot fungus of Sugar-Cane, Helminthosporium sacchari Butler.**—*Plant Physiol.*, iv, 2, pp. 193–212, 2 figs., 1929.

Tests to determine whether the causal organism of sugar-cane eye spot, *Helminthosporium sacchari* [*H. ocellum*: see preceding abstract] produced substances toxic to the leaves of the susceptible H. 109 variety when grown in pure sucrose solutions and in beef

extract bouillon media gave negative results. Leaves inoculated with the filtrate of such cultures by means of a hypodermic needle or capillary tube showed no reaction indicative of the presence of a toxin. Tests on sugar-cane leaves with filtrates of cultures of the same fungus on Richards's solution, however, showed the presence of a toxic substance which was found to persist after twenty minutes' sterilization in the autoclave at 15 lb. pressure; this process would almost certainly destroy enzymes and coagulate most proteins. Dilute solutions of potassium nitrite induced the same reaction in susceptible sugar-cane leaves as these filtrates. This reaction consisted in a partial or total yellow discoloration of the leaves, sometimes accompanied by the development of longitudinal brownish-red streaks. The leaves placed in the toxic filtrates always wilted and lost their normal glossy appearance.

The filtrates of cultures of *H. ocellum* in Richards's solution, and to a lesser extent in asparagin, were found to contain considerable quantities of nitrites, which were absent from filtrates of bouillon cultures. These nitrites are, therefore, regarded as the cause of the symptoms described above. The toxic substance in such filtrates appears to be a product of the environmental medium rather than a direct outcome of the metabolism of the fungus. *H. ocellum* seems to possess a marked capacity for the reduction to nitrites of some of the lower nitrogen compounds in its substratum; these nitrites in turn are toxic to the leaf tissues of the host, one of their effects being a diminution of the chlorophyll content.

The practical application of these investigations lies in withholding nitrogenous fertilizers during seasonal periods when the climatic conditions favour eye spot infection; such compounds should be given only when environmental factors are opposed to the development of the fungus.

BURCHARD (G.). **Beiträge zur Kenntnis parasitischer Pilze.**—[Contributions to the knowledge of parasitic fungi.]—*Phytopath. Zeitschr.*, i, 3, pp. 277–315, 27 figs., 1929.

From collapsed *Pinus sylvestris* seedlings sown in sterilized soil the writer isolated four fungi, viz., *Moniliopsis klebahni* n. sp., *Verticillium glaucum* Bonord., *Phoma* sp., and *Sclerotium* sp., of which only the first-named proved pathogenic to pine and other conifers (*Larix europaea*, *Pseudotsuga douglasii* f. *viridis* [*P. taxifolia*], and *Abies alba*) in a series of inoculation experiments [which are fully described]. *M. klebahni* is characterized by a hyaline, septate, branched mycelium, the lateral branches forming conidium-like segments which at maturity are yellow to brownish, subspherical, 20 to 25 by 12 to 20 μ. On agar media these chains agglomerate into sclerotium-like structures measuring 2 to 5 mm. in diameter. The fungus differs from *M. aderholdi* [*R.A.M.*, vii, p. 426 *et passim*] by its reduced aerial mycelium, longer rows of conidal segments, and absence of sclerotia on the host. Further, *M. aderholdi* is only known to attack angiosperms, whereas *M. klebahni* was parasitic only on conifers.

Heavy damage was caused in the Hamburg district during 1927 by cane blight of raspberries (*Didymella applanata*) [the life-

history and symptoms of which are fully described: see above, p. 117]. The mycelium developing from the ascospores (which are oval, uniseptate, and measure 6 by 3 μ) penetrates the cortex, ruptures the sclerenchyma and mesenchyma, and reaches the pith; at this stage the brownish-red to purple, sharply defined spots are formed (April to June) on the young canes and young lateral branches of old canes. The pycnidia of the imperfect stage, measuring 150 by 140 μ, are produced during August and September, the uniseptate, hyaline conidia, 4 to 5 μ in diameter, being discharged in long tendrils. Infection is also caused by these conidia but examination of the spots so produced shows that this type of infection is confined to the primary cortex outside the sclerenchyma. These spots remain practically stationary during the winter, expansion taking place only when the perithecial stage develops again in the spring. Attention is drawn to a mode of infection not hitherto mentioned in the literature on cane blight, viz., through contact between diseased and healthy canes, both the mycelium and the conidia being able to pass from the former to the latter. The fungus was further shown to pass from infected roots to healthy shoots. Pure cultures from ascospores and pycnospores agreed in their mycelial characters. Pycnidia were developed in the centre and at the periphery from closely septate branching hyphae. Good control of *D. applanata* on a small scale was obtained by covering the spots for 24 hours with cotton-wool soaked in 1 per cent. formaldehyde.

The results [which are fully described] of inoculation experiments with *Sclerotinia tuberosa* [ibid., iii, p. 59] on *Anemone nemorosa* showed that infection of the rhizomes occurs solely through the mycelium in the soil arising from the ascospores discharged by the apothecia.

Marchal (E.) & Steyaert (R. L.). **Contribution à l'étude des champignons parasites des plantes au Congo Belge.** [Contribution to the study of the fungous parasites of plants in the Belgian Congo.]—*Bull. Soc. Roy. Bot. de Belg.*, lxi (N.S. xi), 2, pp. 160–169, 5 pl., 1929.

This list of 39 fungous parasites of plants in the Belgian Congo identified at the Gembloux Phytopathological Station, contains (*inter alia*) the following items of interest. *Venturia elaeidis* n. sp., found on withered oil palm leaves, is characterized by globose, papillate, black perithecia, 200 μ in diameter; filiform, more or less irregularly flexuous setae measuring 80 to 100 μ in length; long-elliptical, astipitate asci, 45 by 12 μ; and distichous, ellipsoid, hyaline ascospores, rounded at both ends and measuring 12·5 to 17 by 3 to 4·2 μ.

Laestadia caricae n. sp. forms on the leaves and petioles of papaw numerous depressed-globose, black perithecia; the short- and broad-stalked asci measure 60 to 70 by 12 to 16 μ, and the irregularly distichous, fusoid, hyaline ascospores, 12·6 to 18 by 3·6 to 5·4 μ.

Didymosphaeria panici n. sp., found on living leaves of *Panicum maximum*, is characterized by globose, papillate, black perithecia, 200 μ in diameter; subcylindrical, short-stalked asci with rounded

apices, measuring 70 by 9 μ; filiform paraphyses; and distichous or partly monostichous, elliptical, brown ascospores with broad upper cells tapering towards the apex, slightly constricted in the middle, measuring 12·6 to 16·8 by 4·2 μ.

Leptosphaeria cynodontis dactyli n. sp., on living leaves of *Cynodon dactylon*, is characterized by scattered, globose, papillate, black perithecia, 80 to 90 μ in diameter; cylindrical asci, often more or less curved, 38 by 6·5 μ; obliquely monostichous, fusoid, straight or slightly curved, triseptate, brown ascospores, somewhat constricted at the septa and measuring 12·6 to 16·8 by 3·2 to 4·4 μ.

Puccinia graminis has been found on *Panicum maximum* in two localities of the Congo-Kasai Province, as well as on wheat in the Eastern Province. *P. triticina* has also been observed on wheat at the Haut-Ituri experimental farm (Eastern Province). According to De Wildeman, neither *Berberis* nor *Thalictrum* has been recorded in the Haut-Ituri district, so that both the above-mentioned rusts are apparently able to dispense with their alternate hosts.

Phyllosticta voandzeiae n. sp. forms ill-defined, irregularly circular, brownish-purple spots on living leaves of *Voandzeia subterranea*. The pycnidia of the fungus are punctiform, subglobose, and measure 150 μ in diameter, while the hyaline, ellipsoid, more or less irregular spores are 12·6 to 21 by 4·2 to 8·4 μ.

Cercospora mori n. sp., occurring on mulberry leaves (*Morus* sp.) in the Congo-Kasai Province, is characterized by widely divaricate, irregularly flexuous, simple, multiseptate, brown conidiophores up to 90 μ in length and bearing brown, fusoid-cylindrical, 4- to 5-septate conidia with subacuminate apices, measuring 31 to 64 by 4·4 μ. This species differs from *C. pulvinata* in various points, e. g. the absence of a pseudostroma, non-continuous conidiophores, and longer, narrower, and more septate conidia. It differs from *C. moricola* in its non-fasciculate conidiophores and its coloured conidia of a different type.

C. capsici n. sp. forms spots, 3 to 5 mm. broad and irregularly confluent, on the leaves of chilli pepper (*Capsicum frutescens*) at Moma (Equatorial Province). The conidiophores of the fungus are fasciculate, simple, short, septate, and fuliginous, while the cylindrical, triseptate, hyaline conidia measure 50 by 5 μ.

Fusarium paspali was found on *Paspalum scrobiculatum* var. *commersonii*.

Leonian (L. H.) & Geer (H. L.). **Comparative value of Phytophthora sporangia obtained under standard conditions.**—*Journ. Agric. Res.*, xxxix, 4, pp. 293–311, 1929.

The authors point out that considerable confusion exists in the literature on the classification of species of *Phytophthora*, due to the lack of standardized methods of investigation and the great variability of the individual species. This is illustrated by a table in which the sporangial measurements noted by previous workers in 27 species are reviewed. Their own measurements of the sporangia of 94 species and strains cultured under standard conditions [details of which are given] led them to recognize that, although

the size factor of the reproductive organs is not of primary importance in taxonomy, the organisms studied may be separated into four groups [cf. *R.A.M.*, v, p. 4], based on the mean length and width of their sporangia. Their studies also appeared to indicate that at least some of the existing species are well enough established, but that others should be merged with older species. The *infestans* group is believed to be decidedly secure with its three species, *P. infestans*, *P. thalictri*, and *P. phaseoli*. The next group which may be readily identified consists of *P. cinnamomi*, *P. cryptogea*, *P. erythroseptica*, and *P. mexicana*; the study so far conducted of the different strains of this group indicates that at least three of these four species should be allowed to stand for the time being, but *P. mexicana* should be merged in *P. erythroseptica*. *P. capsici* is considered to be specifically identical with *P. citrophthora*. *P. cactorum*, in which both paragynous and amphigynous antheridia are known to occur, may be close to *P. omnivora*; indeed, forms of *P. cactorum* which possess no sexual stage can only be referred to *P. omnivora*, but the authors reserve their final judgement on this species pending the completion of further work now in progress. The confusion which now exists in the *P. omnivora* group can be largely eliminated by dividing it into six arbitrary types, namely, (1) *colocasiae-microsporous*, (2) *colocasiae-macrosporous*, (3) *faberi-microsporous*, (4) *faberi-macrosporous*, (5) *parasitica-microsporous*, and (6) *parasitica-macrosporous*. The first can be characterized by a smooth-combed colony habit and more elongated but smaller-sized sporangia: the second is similar, except that the spores are larger; the third has the same colony habit but its sporangia are spherical: the fourth is like the third, except for its larger sporangia; the fifth type is characterized by a curly, coagulated type of culture and gnarled submerged hyphae, with sporangia either elongated or spherical; the sixth is similar to the fifth, except that its sporangia are larger. Such an arrangement provides for most, if not all, of the variations of this group, and would save the worker from classifying the same organism under two or more specific names, whenever such a fungus happens to dissociate and throw off dissimilar phases.

LINDER (D. H.). **A monograph of the helicosporous Fungi Imperfecti.**—*Ann. Missouri Bot. Gard.*, xvi, 3, pp. 227–388, 20 pl., 13 figs., 4 graphs, 1929.

The helicosporous Fungi Imperfecti described by the author include 14 genera comprising 72 species. Representatives of five of the seven genera included in the Dematiaceae and Mucedineae have been cultured and compared as regards their life-history and environmental relations. These are *Helicoma mülleri*, *H. curtisii*, *Helicosporium aureum*, *H. gracile*, *Helicomyces scandens*, *Helicodendron tubulosum*, *H. triglitziensis*, and *Helicoon sessile*. Hitherto the existence of relations between the perithecial and conidial stages have been inferred from the presence of the two forms together. By pure monospore cultures, however, the perfect stage, *Lasiosphaeria pezizula*, was definitely shown to be connected with *Helicoma curtisii*. A key to the genera of this group of the Fungi Imperfecti is given.

Böning (K.). **Weitere Beiträge zur Kenntnis der Krankheiten des Tabaks.** [Further contributions to the knowledge of Tobacco diseases.]—*Arb. Bayer. Landesanst. für Pflanzenbau und Pflanzenschutz*, 8, 32 pp., 1 col. pl., 8 figs., 1 graph, 1929.

Tobacco wildfire [*Bacterium tabacum*] was prevalent in the Bavarian crops after the heavy rains in May and June, 1928, but during the dry spell in July and early August infection came to a standstill, and there were no further outbreaks in connexion with the showery weather in the latter part of August. The total damage to the crop from this source is estimated at only 1 per cent. [*R.A.M.*, vii, pp. 547, 548]. A striking correlation was observed between the 'topping' operations and the incidence of wildfire. Plants deprived of their tops possess no young shoots to utilize the nitrogen from the soil, with the result that it is deposited in excessive quantities in the lower leaves, rendering them highly susceptible to infection. These effects were found to be somewhat mitigated by heavy applications of potash. These observations suggest that topping should not be done too early or too drastically, especially after a long dry spell.

The severe form of anthracnose caused by a species of *Colletotrichum* differing slightly from *C. nicotianae* and known to Bavarian planters as 'stem and rib scorch' of *Nicotiana rustica* has already been described [ibid., viii, p. 680]. A milder form of the disease is characterized by the occurrence on the leaves of brown spots, surrounded by a narrow dark brown ring and often encircled by a water-soaked zone. The ribs, petioles, and stems may also be affected. Control measures should include the use of healthy seed, spraying the seed-beds every five to six days with 0·5 to 1 per cent. Bordeaux mixture, and suitable cultural practices [which are indicated].

During the hot, dry summer of 1928, *N. rustica* suffered from a wilt disease associated with a species of *Fusarium*. In severe cases the whole aerial system of the plant was withered and collapsed, the stem base often being rotted while the roots were usually healthy. A milder form of attack was manifested by whitish-grey streaks on the stems and by the partial or entire shrivelling of the petioles. The leaves of affected plants, sometimes only on one side, were wilted and drooping. The fungus was isolated and produced uni- to pluriseptate, lunate spores and globular, usually concatenate chlamydospores, but no further description is given.

Tollenaar (D.). **Jaarverslag 1 Mei 1928—30 April, 1929.** [Annual report 1st May, 1928 to 30th April, 1929.]—*Proefstat. Vorstenlandsche Tabak, Meded.* 62, 55 pp., 3 pl., 3 diags., 1929.

In view of the steady increase of mosaic disease in the Vorstenland (Java) tobacco plantations, especially in the EK variety, an attempt has been made to obtain resistant strains by selection. Only five individuals among a population of 8,000 EK plants in a heavily diseased plot remained free from the disease. Practically all the progeny of these five plants, however, contracted mosaic on

inoculation with the sap of diseased plants. The Kanari variety appears to be less susceptible than EK.

A new disease, which has been termed 'perforation' disease, was observed in 1928. The chief symptom is the development of dry, brown spots on the leaves above the upper basal ones. The brown dots and stripes up to 1 cm. long are scattered on the leaves, especially the youngest, and the irregular growth of the leaf blade imparts a crinkly appearance to the plants, which in the early stages resemble potatoes attacked by stipple-streak [cf. *R.A.M.*, viii, p. 155]. Ultimately the diseased spots fall out and the leaves become worthless. Further researches on the etiology of the disturbance are in progress.

The 'lanas' disease [*Phytophthora nicotianae*: ibid., viii, pp. 270, 471] continues to cause considerable damage on some tobacco plantations. Slime disease [*Bacterium solanacearum*: ibid., viii, p. 553] attacked the tobacco crops on land previously used for the cultivation of *Arachis hypogaea* [ibid., vii, p. 277].

GIDDINGS (N. J.), ALLARD (H. A.), & HITE (H. B.). **Inactivation of the Tobacco-mosaic virus by high pressures.**—*Phytopath.*, xix, 8, pp. 749–750, 1929.

In 1919 the writers conducted a few experiments to determine the effect of high pressure on the tobacco mosaic virus.

Freshly expressed juice from diseased plants was sent from Washington, D.C., to the West Virginia Agricultural Experiment Station, where the tests were carried out with a special pressure equipment (*West Virginia Agric. Exper. Stat. Bull.* 146, 1914) at room temperatures (20° to 22° C.). Twenty-six out of 30 young Maryland Mammoth tobacco plants inoculated with untreated mosaic juice direct from the ice box developed mosaic symptoms, which also appeared in 31 out of 40 plants inoculated with juice subjected to 75,000 lb. pressure; no infection developed in any plants inoculated with mosaic juice subjected to pressures of 130,000 lb. or above.

The pressure required to inactivate or destroy the tobacco mosaic virus is higher than the pressure death point of a number of bacteria and also than that of *Saccharomyces cerevisiae* and *S. albicans*, but is lower than that of *Bacillus subtilis*. The enzyme zymase is inactivated or destroyed by a lower pressure than that required to kill the tobacco mosaic virus, the pressure death point of which probably corresponds approximately to that which inactivates pepsin.

HOPKINS (J. C. F.). **Leaf spotting of Tobacco caused by mosaic.**—*Rhodesia Agric. Journ.*, xxvi, 9, pp. 912–916, 2 pl., 1929.

After pointing out that the damaging effects of mosaic disease of tobacco [*R.A.M.*, vii, p. 476] are still imperfectly appreciated by some growers in Rhodesia [cf. ibid., viii, p. 533] the author states that in addition to the well-known mottling of the foliage the disease also causes the plants to remain stunted; affected leaves are usually narrower and of a thinner texture than are normal ones and many have to be graded as 'short' leaves after curing. Mal-

formations and blisters may develop, the narrowness may be such that reaping becomes unprofitable, and under certain conditions spotting and scorching may be so severe as to render the leaf commercially worthless.

Common types of spotting associated with tobacco mosaic in Rhodesia are figured and described. One of these appears first as a small, circular, brown spot which gradually enlarges to about $\frac{1}{8}$ in. in diameter; individual spots seldom exceed this size, but they may be very numerous and coalesce into light brown blotches in which, however, the outline of the original spots remains discernible. A faint zonation may usually be detected in the separate spots but the yellow halo associated with bacterial diseases is never present. Leaves showing this type of spot, may, under certain conditions, not exhibit any marked mottling.

A second type of spotting, which develops on mosaic Turkish tobacco plants, is characterized by larger, darker, more angular spots with a distinct zonation.

What is commonly known as sun scorch [ibid., vi, p. 583] may also be a cause of considerable loss. In this condition minute brown spots first appear on the leaf, between the veins, and increase in numbers until they produce 'rusted' or scorched areas half an inch or more in diameter. These patches enlarge and coalesce until nearly the whole of the leaf surface may become a mass of torn shreds of dead tissues. Mosaic mottling is frequently absent from scorched leaves but usually present on leaves higher up the stem. Although scorching is popularly attributed to the action of the sun, prolonged dull or rainy weather and exceptional cold also favour the condition, observations indicating that both forms of necrosis, i.e., spotting and scorching, are definitely associated with periods of slow growth in mosaic-diseased tobacco plants. Experimental inoculations of tobacco with the mosaic virus confirmed this. When the inoculations were made in the normal growing season typical mosaic mottling without necrosis invariably developed, but when they were made during winter, and the plants were not growing rapidly, the form of spotting described above always developed first, a faint mottling sometimes appearing later.

A third type of spotting also results from mosaic infection and is accompanied by the usual mottling. Very small white spots, developing as a rule in the dark green mosaic areas, are the first symptom; they are usually bounded by a narrow brown margin and as they become enlarged they coalesce into dead, light brown areas which contain the numerous, approximately circular, white spots, placed close together. In severe cases the cured leaf may be worthless.

Observations indicated that the presence of the disease in the seed-beds is due principally to refuse from infected plants of the previous season, which reaches the beds in the form of native snuff or 'nyoka' tobacco made from the suckers of mosaic plants not uprooted after reaping. The best control has been obtained by removing infected plants as soon as they are noticed; drastic action at the beginning of the season is most necessary. The early removal of stalks is also recommended and the boys should be

discouraged from smoking or using snuff while working on the seed-beds.

Angell (H. R.). **Blue mould of Tobacco: investigations concerning seed transmission.**—*Journ. Australia Council Sci. & Indus. Res.*, ii, 3, pp. 156–160, 1929.

To investigate the mode of transmission of blue mould of tobacco [*Peronospora* sp.: *R.A.M.*, ix, p. 3] in Australia different [named] varieties of seed from plantations where the disease had been present the previous season, together with seed from an apparently healthy plant which had grown to maturity in a diseased seedling bed and the young capsules of which had been inoculated with a conidial suspension of the fungus, were sown in a greenhouse; Hickory Prior seed from Canada, where the disease has not been reported, was used as a control. On the seventeenth day after sowing, the conidiophores and conidia of *Peronospora* appeared in 14 centres in Blue Prior seedlings, in 9 centres in the seedlings from the inoculated plant, and in 5 centres in the variety Warne. Other diseased plants were growing in the open some 70 feet away, but these infections were not attributed to air-borne spores as White Burley and the control seedlings remained healthy for 8 and 10 days longer, respectively.

A further test was conducted in which the earthenware flats, soil, and water used were sterilized in an autoclave and the plants were protected from air-borne spores by a glass covering. The Blue Prior seedlings and others of two unknown varieties developed the disease 17 days after sowing, but the Canadian control plants remained unaffected as also did Blue Prior seedlings grown from seed immersed for three minutes in alcohol. It is tentatively concluded that the primary infection obtained in both experiments was seed-borne. Observations in the field at Mareeba, Queensland, where blue mould spread from Australian to Canadian seedlings, though the locality is more than 20 miles away from the nearest diseased tobacco plants and there are no wild hosts in the vicinity, tended to confirm this view.

Control is recommended by the use of clean seed, sowing in soil not previously set to tobacco, and placing the beds as far away as possible from alternative hosts.

Hopkins (J. C. F.). **Frog eye disease of Tobacco.**—*Rhodesia Agric. Journ.*, xxvi, 8, pp. 817–822, 3 figs., 1929.

Of the many forms of leaf spot of tobacco noted in Rhodesia during 1929, frog eye (*Cercospora nicotianae*) probably caused the most damage. It was present in seed-beds, in the field crop, and in the barns in all districts and was more widespread than ever known before, probably owing to heavy rainfall favouring the development of the fungus and delaying the ripening of the leaf.

Usually the spots are roughly circular, with an ashy white or pale brown centre, generally surrounded by a narrow dark brown margin, but sometimes they are somewhat angular and without the white centre, when they are difficult to distinguish from angular spot lesions (*Bacterium angulatum*), though a small white area nearly always appears later.

An even more serious form of the disease than that in the field is a black spotting which develops on apparently clean leaf in the barns [cf. *R.A.M.*, viii, p. 204]. This condition, known locally as 'pole burn' or 'pole sweat' is caused by incipient infections, which are overlooked when the leaf is reaped and develop in the humid atmosphere prevailing during the early stages of curing. At 120° F. the growth of *C. nicotianae* in the leaf appears to be checked and the cells in the infected parts turn black. In extreme cases numerous spots coalesce to form irregular black blotches covering almost the entire surface of the leaf and rendering it unmarketable. The isolated, roughly circular, brittle black spots appear to characterize the disease on the bright grades of leaf, while the 'pole burn' form is more common on the medium grades, particularly when the leaf is of a thick, coarse texture.

Attacks of *C. nicotianae* are favoured by over-ripeness of the leaf due to delayed reaping, while the disease is also most severe during periods of continued rain. In the barns, high humidity and temperatures of 90° to 100° stimulate the germination of the spores and growth of the fungus in isolated spots, so that even clean leaf with spores adhering to the surface becomes affected after curing has been in progress for some time. The centres of infection can usually be detected upon a newly reaped leaf if it is held up to the light, when they appear as minute, pale green points.

The disease in the seed-beds is usually overlooked or confused with *Bact. angulatum*; how far it is concerned with the appearance of frog eye in the field crop is uncertain, but some infected material is probably transferred from the seed-bed when planting out. Spotted leaves are removed at 'pruning' but remain as a source of danger, as they are not destroyed unless *Bact. angulatum* or *Bact. tabacum* is thought to be present. Infection in the seed-beds largely depends on the condition of the plants; strongly growing seedlings of a good colour have never been observed to be affected, those which are attacked being seedlings which have been left too long before pulling, or which are turning yellow as a result of nitrogen deficiency. The existence of these unhealthy individuals may be an important factor in the subsequent infection of the maturing crop.

The principal means of control lies in removing and destroying all infected material before numerous spores are produced. Where priming is carried out assiduously the disease is kept within bounds in the field, and consequently the black barn spotting does not become serious. Definite evidence has been obtained that no reduction in the yield of marketable leaf follows when plants are primed by removing the lower leaves even to leave as much as 2 feet of bare stalk. As mature leaf is the most readily attacked the crop must be got into the barns early. The black barn spot can largely be prevented by regulating the moisture during the early stages of curing, ample ventilation and low moisture reducing the spotting to small proportions. Some growers prefer to run the temperature in the barns up to 160° as quickly as possible and then rake out the fires, after which curing is proceeded with as usual; the danger of this method is that it may ruin the colour of the leaf. The prevention of the disease in the seed-beds involves

careful preparation of the soil and an even distribution of the fertilizer in order to raise strongly growing plants; the regular use of Bordeaux mixture (4–4–50) is also a help. The old beds should be dug over and the plants promptly destroyed.

Bertotti (F.). **Studies on Chestnut molds.**—*Boll. Lab. Sperim. Fitopat.*, Turin, vi, 3, pp. 6–8, 1929. [Abs. in *Chem. Abstracts*, xxiii, 22, p. 5517, 1929.]

Edible chestnuts exposed to invasion by *Penicillium crustaceum* should be treated with dilute HCl or H_2SO_4 without subsequent drying. Dusting with sodium benzoate, iron sulphate, and salicylic acid was found useless for this purpose [*R.A.M.*, viii, p. 614].

Panisset (Thérèse E.). **Daldinia concentrica attacking the wood of Fraxinus excelsior.**—*Ann. of Appl. Biol.*, xvi, 3, pp. 400–421, 23 figs., 1929.

An examination of ash wood (*Fraxinus excelsior*) in the condition in which it is known in the timber trade as 'calico wood', i.e., marked by irregular, brown to black lines and patches but remaining sufficiently firm to be of commercial use, showed the presence of both colourless and brown hyphae; in some places the walls and cell contents were stained brown.

When a piece of this wood was kept under moist conditions, small, upright, pale pink mycelial masses bearing stalked, colourless, ovoid conidia formed. The latter measured 6·5 to 8 by 5 to 6 μ, were slightly pointed at the proximal end, and were borne on verticillate branches of the hyaline conidiophores. They agreed with the conidial stage of *Daldinia concentrica*.

When these conidia and also ascospores taken from *D. concentrica* on living ash wood were grown on various [named] solid and liquid media, they gave cultures agreeing in all essential characters. Ash wood attacked by *D. concentrica* was found to show the characters of calico wood. It is concluded, therefore, that this fungus is responsible for the condition.

It was ascertained [by methods which are indicated] that *D. concentrica* demands a considerable amount of water in the wood, a weak supply of oxygen, at least for the development of the vegetative mycelium, and that the spores prefer a neutral medium and on germination can attack sound wood. The fungus grew on the heartwood of numerous woods that were tested but had little effect on the cell walls, as was shown by the firmness of the affected wood, the passage of the hyphae solely through the pits, and the lack of change in lignin or pectin reactions.

Bagchee (K. D.). **Preliminary note on the investigation of Sal thicket fungus disease.**—*Indian Forester*, lv, 8, pp. 421–429, 2 pl., 1929.

The thread blight of sal (*Shorea robusta*), commonly known as the sal thicket fungus, was first reported from Angul Division, Orissa, India, in 1910 and again in 1916 and 1928.

The most conspicuous symptom of the disease is the white

mycelial strand running upwards on the surface of the bark to the leaves. At the axils of smaller twigs and leaves the thread develops into a small, oblong cushion of white mycelium which may kill a small patch of bark. The young buds in the leaf axils and also the terminal buds are sometimes wholly covered by a mycelial felt. From the petioles the strands reach the leaf blades, where they again split up into numerous very fine, delicate threads which extend like a fan over the leaf. In the early stages of attack the infected areas of the leaves present a greyish-white appearance, which is succeeded by a yellowish-brown tinge and ultimately by the development of dull, yellowish-brown patches of necrotic tissue. The fungus not only causes premature defoliation but also kills the young terminal buds. Die-back of the branches and leading shoots follows, often producing a stag-headed condition of large saplings and killing smaller ones. The collar and root system were found to be quite unaffected by the disease.

The inspection of three forest ranges of the Angul Division showed that at least 28 other [named] species commonly associated with sal regeneration, including *Zizyphus jujuba*, *Bauhinia malabarica*, and *Cassia fistula*, are liable to infection by the thicket fungus. The disease is most prevalent in the immediate vicinity of ravines and streams, where 25 to 50 per cent. of the saplings may be attacked. The fungus may spread by direct contact between infected and healthy trees or by the dissemination of infected leaves during leaf fall by the wind or through the agency of birds or ground animals.

The sal thicket disease has also been reported from the Madras Presidency adjoining the southern boundary of Orissa, and it has recently been observed in Dehra Dun on sal, *Hiptage* sp., *Zizyphus* sp., and *Mallotus* sp.

Discussing the identity of the fungus, the author states that it evidently belongs to the Basidiomycetes on account of its fan-shaped mode of spread, the presence of clamp-connexions in the hyphae, and its cultural peculiarities. Pending further investigations, however, it cannot be definitely referred to any genus.

The results of field observations indicate that the spread of the disease may be arrested by the periodical cleaning of the trees to remove climbers, effective pruning, destruction of infected material after leaf fall, and possibly controlled burning in areas where outbreaks occur in epidemic form.

Service phytopathologique spécial du Ministère de l'Agriculture. Règlement (Arrêté royal du 13 mai 1929). [Special phytopathological service of the Ministry of Agriculture. Regulation (Royal Decree of 13th May, 1929).]—*Bull. Soc. Centr. Forest. Belgique*, xxxvi, pp. 388–391, 1929.

By a Royal Decree dated 13th May, 1929, a chief inspector and a number of assistants are appointed to carry out a special phytopathological inspection service in Belgium, with the right of entry to nurseries, etc., and of examining the plants therein, especially those destined for export. The importation of nursery stock showing the presence of any injurious plant or animal parasite is forbidden. No nursery produce may be exported except from

areas recognized by the inspection service as free from injurious parasites. The Minister of Agriculture may require nursery produce destined for export to be accompanied by a certificate stating that it is free from diseases and pests before being exported. The owner of any nursery, etc., where the inspectors find any injurious animal or vegetable parasite to be present must arrange for its destruction. Arrangements can be made for voluntary inspection of plants not destined for export.

Plant Importation Regulations.—*Rhodesia Agric. Journ.*, xxvi, 9, p. 873, 1929.

Government Notice no. 440, of the 26th July [1929], prohibits the importation into Southern Rhodesia of maize seed (*Zea mays*) from India, the Philippine Islands, the Dutch East Indies, and any other country where maize is affected by *Sclerospora* diseases, of elm seeds and plants, including all species of *Ulmus*, from Europe or any other part of the world where *Graphium ulmi* [*R.A.M.*, viii, p. 704] exists, and of chestnut seeds and plants, including all species of *Castanea*, from North America and all other places where *Endothia parasitica* is found. The importation of tea seeds from India, Japan, and Formosa is also prohibited except by special permit issued at the discretion of the Secretary of the Department of Agriculture; consignments of these seeds must be accompanied by a certificate signed by a scientific officer of the Indian Tea Association, the Imperial Department of Agriculture of India, or of the Department of Agriculture, Japan, certifying that blister blight (*Exobasidium vexans*) does not exist or has not been present within ten miles of the estate or garden where the seeds were grown.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, ii, 4, pp. 187–190, 195–200, 1929.

Latvia. As from 18th October, 1928, potatoes may be imported into Latvia only by special permission of the Ministry of Agriculture, and all consignments of potatoes from abroad must be accompanied by a duly authenticated certificate vouching for the absence of wart disease (*Synchytrium endobioticum*) from the country of origin. The consignments will be examined on arrival by experts, and those containing tubers infected by *S. endobioticum*, *Phytophthora* [*infestans*], *Fusarium*, and bacteria will be rejected. Potatoes imported for purposes of investigation must be accompanied by a certificate vouching for their freedom from wart disease, and stating that no infection by *S. endobioticum* occurs in the place of origin or within a radius of 50 m. [? km.].

Spain. A Royal Decree of 5th February, 1929, regulates the organization of the phytopathological service in Spain. The inspection of imported goods is confined to those products originating in countries infested by serious diseases, e.g., potato wart [*Synchytrium endobioticum*: *R.A.M.*, viii, p. 129].

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

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HUTCHINSON (W. G.). **Studies on the mycelium of Cronartium comptoniae Arthur on Pinus sylvestris L.**—*Phytopath.*, xix, 8, pp. 741–744, 1 fig., 1929.

A study of the mycelium of *Cronartium comptoniae* [*R.A.M.*, viii, p. 685] was carried out to facilitate the determination of the presence of the rust on Scotch pine (*Pinus sylvestris*) in the absence of aecidial fructifications and of the definite symptoms, e. g., swelling and cracking of the bark, muscling of the wood, and the formation of fusiform galls, associated with the later stages of the disease. The hyphae were found to be very irregular in outline, ranging from 3·6 to 6·2 μ in width, and composed of uninucleate cells. Numerous haustoria occur in the cells of the cortex and phloem. At the point of constriction where the haustorium enters the cell, it measures only 1 to 2 μ in width compared with 5·2 μ within the cell and 8 μ in the bulging parts. The mycelium very seldom occurs in the xylem, and in such cases it appears to be inside the tracheid cells and growing through the bordered pits.

LAING (E. V.). **Notes from the Forestry Department, Aberdeen University.**—*Scottish Forestry Journ.*, xliii, 1, pp. 48–52, 1 pl., 6 figs., 1929.

It is considered doubtful whether all cases of browning of *Thuja gigantea* foliage attributed to *Keithia thujina* [*R.A.M.*, viii, p. 279] are due to this fungus, the writer's observations having shown the constant presence of a species of *Pestalozzia* on infected material. The conidia are borne in subepidermal pycnidia and have four septa, the three median cells being dark brown and the two terminal ones hyaline. The distal cell bears three or four setae. This species of *Pestalozzia* resembles *P. funerea* or *P. guepini* in its spore characters [ibid., viii, p. 520], but the absence of swellings and constrictions of the *Thuja* stems appears to exclude the former, while the flask-shaped pycnidia and conidial discharge in a tendril of gelatinized hyphae differentiate it from the latter. Inoculation experiments on two-year-old *T. gigantea* seedlings gave positive results. It has been observed that the drooping variety of *Thuja* (*T. gigantea* var. *pendula*) is immune from attack by this fungus.

Hendersonia acicola produces a whitish-grey discoloration of the crowns of Scots and mountain pines [*Pinus sylvestris* and *P. montana*] in July and August, followed at a later stage by defoliation. The small, black, spherical pycnidia rupture the epidermis and discharge the tri- or pluricellular, fusiform, olive to rust-coloured conidia. The shoots infected by this fungus are in every way similar to those attacked by *Hypodermella sulcigena*, of which *Hendersonia acicola* is believed to be the conidial stage [ibid., viii, p. 687].

Complete defoliation of the current year's shoots of *Picea excelsa*, accompanied by a downward bending of the twigs, is caused by *Ascochyta piniperda*, the hyphae of which occur in the living tissues of part of the preceding year's growth, while the pith of the two-year-old shoot is browned for two or more inches of its length. *P. sitchensis* is attacked in an exactly similar manner.

Baggchee (K. D.). **Investigations on the infestations of 'Peridermium complanatum', Barclay, on the needles, and of Peridermium himalayense n. sp., on the stem of Pinus longifolia, Roxb. Part I. Distribution, pathological study of the infections, and morphology of the parasites.**—*Indian Forest Records* (Bot. Ser.), xiv, 3, 24 pp., 14 pl., 1929.

A detailed account is given of the writer's investigations on the blister rust of *Pinus longifolia*, which is reported to be steadily gaining ground in some forests of the Himalayas, where it is spreading to healthy natural regenerations and attacking even vigorous trees.

The aecidial stages of the two fungi long known as *Peridermium complanatum* var. *acicola* and var. *corticola* are now proved to be two distinct species, differing completely in morphology, distribution, and pathological effects. The former causes needle infection which may not ultimately damage the tree, while the latter (here described for the first time as *P. himalayense* n. sp.) forms blisters on the bark of the stems and causes heavy losses by killing the trees [*R.A.M.*, viii, p. 77]. The distribution of *P. himalayense* is limited to certain areas in the Kumaon region, while *P. complanatum* is common in Dehra Dun, Almora, and other districts where the stem parasite has not yet been found.

The symptoms of stem infection by *P. himalayense* include the exudation of resin from cracks in the bark, shrivelling and peeling of the latter, hypertrophy of the infected tissue due to the separation of the cells by the intercellular mycelium of the fungus, and canker formation with partial or complete girdling of the stem, in which the blue staining fungus (*Ceratostomella* sp.) [ibid., ix, p. 76] is involved in a secondary capacity. The cankers may occur on saplings over 3 ft. high, but are mostly confined to older ones approaching the pole stage.

The mycelium of *P. himalayense* is intracellular in the xylem and older sieve-tubes and intercellular elsewhere except for the large intracellular, clavate or dumb-bell-shaped, sometimes forked haustoria. These organs are generally found in the cortical parenchyma, but occur also in the medullary rays.

A diagnosis of *P. himalayense* is given in English, the chief

differences between this organism and *P. complanatum* being shown by means of a table. The aecidia of *P. himalayense* are usually separate sori, 4 to 12 mm. in length. The peridia are thick, persistent, multilayered (3- or rarely 4-celled in transverse section), and finely grooved laterally. The average dimensions of the outer cells (500 measurements) are 27·9 by 18·2 μ, compared with 38 by (?) 27 μ for *P. complanatum*, and the outer tuberculate wall is 5·2 μ thick. The obovoid to elliptical or irregular aecidiospores measure 23·8 by 16·6 to 29·4 by 17·9 μ (average 24·7 by 17·4 μ), compared with 26·4 by 19·6 μ in *P. complanatum*, and they have a coarsely verrucose wall, 3 to 4·5 μ in thickness. The orange-yellow, ovoid to ellipsoid spermatia are 4·2 by 2·5 μ and the hyphae average 5·29 μ in diameter. The perfect stages of both fungi are unknown.

P. himalayense bears certain resemblances to *Cronartium harknessii* [ibid., viii, p. 684], but differs from this species in its larger pycnospores and peridia and smaller aecidiospores.

WAGENER (W. W.). **Lentinus lepideus Fr.: a cause of heart rot of living Pines.**—*Phytopath.*, xix, 8, pp. 705–712, 1 fig., 1929.

Lentinus lepideus [*R.A.M.*, vii, pp. 131, 690] has been observed in California on living western yellow pine (*Pinus ponderosa*) and sugar pine (*P. lambertiana*), a previously unrecorded host. The examination, some four weeks after felling, of a western yellow pine infected by *L. lepideus* and bearing sporophores showed a roughly spindle-shaped area of decay extending 20 ft. along the bole in both heartwood and sapwood. The fungus had evidently entered through a long, narrow wound dating from 1895, and its subsequent development weakened the tree to such an extent that it blew over during a severe gale. The dead area was found to be in various stages of decay, and a creamy-white mycelial felt had formed between the wood and the over-lying bark. For a depth of about 6 inches round the wound, the wood had disintegrated into long, rectangular, brown, carbonaceous flakes, while the rest of the affected tissues were abnormally soft and inelastic. The colour of the wood was a slightly darker yellow than normal, shading to reddish.

In another case the entire heartwood at the stump of a 188-year-old western yellow pine was involved in a spongy, reddish-brown rot with the resinous, aromatic odour suggestive of *L. lepideus*, two sporophores and an abortive stipe of which were found arising from a shallow, decayed root. Cultures of rotted wood from the stump yielded typical *L. lepideus* growths. Infection is believed to have taken place through a fire scar, dating from about 1850, at the base of the tree.

The upper bole of a sugar pine broken off 133 ft. from the ground showed a decayed area extending down the heartwood of the trunk for 11½ ft. and entering the bases of several living branches. The centre was hollow for some distance down, and on the sides were a number of stained, misshapen, mostly abortive fruit bodies. Details are given of further cases examined.

The early stages of rotting by *L. lepideus* are not marked by any pronounced changes in the wood, but later the infected tissues

become friable, with a cheesy or sticky consistency due to moisture and the infiltration of oleoresins, which impart a highly aromatic odour to freshly rotted areas. In advanced stages the rot closely resembles those caused by *Fomes laricis* and *Polyporus schweinitzii*, but the characteristic odour of the first-named should serve as a distinguishing feature.

L. lepideus has also been found infecting *P. ponderosa* in Arizona, *P. contorta* in Montana, *P. banksiana* in Minnesota, and *P.* sp. in the District of Columbia.

HUBERT (E. E.). **A butt-rot of Balsam Fir caused by Polyporus balsameus Pk.**—*Phytopath.*, xix, 8, pp. 725–732, 2 figs., 1 diag., 1929.

Balsam firs (*Abies balsamea*) in Canada and the United States (Wisconsin and Minnesota) have been subject during recent years to a brown butt rot caused by *Polyporus balsameus* Pk. [*R.A.M.*, vi, p. 265], of which *P. floriformis* Quel., *P. tephroleucus* Fr., and possibly *P. crispellus* Pk. are considered to be synonyms. The disease is a serious factor in the management of pulp stands containing high percentages of balsam fir, especially where the trees have previously suffered from the attacks of the spruce bud worm (*Cacoecia* [*Tortrix*] *fumiferana*).

This butt rot is sometimes recognizable by the typical sporophores of the fungus attached to roots or butt sections, but in other cases the fructifications develop on the ground at a point away from the trunk where a root approaches the surface. Another common sign of attack is a resin flow in the root crotches and along the exposed portions of the roots, accompanied by a general swelling at the base of some of the trees. In the later stages of the rot a downy layer of mycelium develops on the surfaces facing the shrinkage cracks, while the butt sections of diseased trunks give a hollow sound when struck with an axe.

The examination of longitudinal sections of trees in an incipient state of decay reveals a buff or buff-yellow discoloration and softening of the tissues. Diseased cell walls show numerous bore holes, a distinct corrosion of the surfaces, and a reduction of thickness. In advanced stages of decay the tissues are sayal-brown (clay-coloured when crushed), while older rots at the base of infected trees are sometimes hazel- or snuff-brown. The shrinkage cracks are of three types, viz., those following annual rings, those following radial lines, and those in a plane traversing the stem. These cracks often contain a downy to powdery layer of white mycelium, and the rotted wood is easily crushed to a fine powder, which appears to be mainly a lignin compound.

P. balsameus has been constantly found associated with this rot and has repeatedly been isolated from infected wood, grown in pure culture, and inoculated into sterilized Sitka spruce [*Picea sitchensis*] wood, producing in the latter the typical symptoms.

HUBERT (E. E.). **A root and butt rot of conifers caused by Polyporus circinatus Fr.**—*Phytopath.*, xix, 8, pp. 745–747, 1929.

Western white pines (*Pinus monticola*) in northern Idaho have recently been damaged by *Polyporus circinatus*, which enters

through injuries in the roots or collar and produces a serious heart rot of the butt. Especially in areas where basal fire scars are common this fungus, in association with *P. schweinitzii*, causes a considerable percentage of butt rot. *P. circinatus* has further been found in connexion with butt rot on Engelmann spruce (*Picea engelmanni*), Douglas fir (*Pseudotsuga taxifolia*), western hemlock (*Tsuga heterophylla*), western larch (*Larix occidentalis*), and *Picea mariana*.

In the early stages the red root rot caused by *P. circinatus* appears as a dark reddish-brown band surrounding a white pocket of late decay. The dark colour of this rot contrasts with the pinkish, reddish, or purplish tinge of the corresponding stage of *Trametes pini* [ibid., viii, p. 415]. The white pockets have pointed ends resembling those found in the red ring or ray rot of *Pinus ponderosa* caused by *Polyporus anceps* [ibid., viii, p. 278], but no zone lines appear in the rot due to *P. circinatus*, nor have black flecks been observed in the pockets as in the case of spongy sap rot (*Fomes annosus*) or spongy root rot (*Poria subacida*).

The hyphae of *P. circinatus* in *Picea mariana* are not constricted where they traverse the cell walls and they mostly run lengthwise of the wood cells, whereas those of *T. pini* are usually constricted where they pass through the cell walls, and penetrate several walls in a direct line. Cultures of *P. circinatus* on malt agar are readily distinguishable from those of *T. pini* by their darker brown colour and absence of cottony aerial growth.

The sporophores of *P. circinatus* generally develop on the forest duff or on the ground at a short distance from the trunk of the infected tree. They vary considerably in size and colour according to environmental conditions and may readily be mistaken for small or imperfectly developed sporophores of *P. schweinitzii*.

M'Hardy (J.). **Heart rot in conifers.**—*Scottish Forestry Journ.*, xliii, 1, pp. 18–19, 1929.

Practically every European larch [*Larix europaea*] tree in a 36-year-old mixed conifer stand in Fifeshire was found, on felling, to be attacked by heart rot due to *Fomes annosus* [*R.A.M.*, iii, p. 494], which had seriously impaired the quality of the wood. One Douglas fir [*Pseudotsuga taxifolia*] was also slightly infected.

Hubert (E. E.). **A study of laboratory methods used in testing the relative resistance of wood to decay.**—*Univ. of Idaho Bull.*, xxiv, 13, 46 pp., 2 figs., 2 diags., 2 graphs, 1929.

In connexion with a review of previous work on laboratory tests of decay resistance in wood, the need for improved methods is emphasized. The various factors affecting such a study are discussed, with observations on their bearing on the results of resistance tests.

One of the chief needs is a method of controlling the moisture content of the test blocks over a considerable period of time. It is also necessary to prevent, as far as possible, the loss of volatile substances from the wood during sterilization and also the leaching out of water-soluble substances into culture media when these are used.

To overcome these difficulties the author has devised improved methods in which the sterilization is effected by steam at 7 lb. pressure for 30 minutes, the blocks being provided with sufficient water prior to autoclaving to bring the moisture to the desired percentage by weight, and they are then placed in flasks in which the fungus to be tested has been grown on a nutrient medium, the block being kept from contact with the latter by pieces of glass.

Large test tubes of the type known as Roux's potato tubes were even more satisfactory, the nutrient medium on which the fungus is grown being sloped to about half way up the constricted part of the tube and the wood block resting on the upper part of the constriction.

In both cases a modified form of rubber cap was used to cover the plugs so as to prevent loss of moisture by evaporation.

It was found inadvisable to test more than one kind of wood in the same container, as some woods appear to give off substances affecting the rate of decay of others in the vicinity.

Falck (R.) & Coordt (W.). **Der Methoxyl-Gehalt beim Lignin- und Cellulose-Abbau des Holzes.** [The methoxyl content in the lignin and cellulose decomposition of wood.]—*Ber. Deutsch. Chem. Gesellsch.*, lxi B, 9, pp. 2101–2106, 1928.

The methoxyl and lignin contents of pine wood attacked by red rot [*Fomes annosus*], pine beams affected by the 'corrosion' type of decay due to dry rot (*Merulius*) [*lacrymans*], and 'destruction' decays of various stages were determined [*R.A.M.*, vii, p. 690; viii, p. 476]. The methoxyl content (percentage by weight) of sound timber and that infected by red rot in varying degrees was practically constant, whereas an increasing incidence of dry rot was accompanied by a corresponding rise in methoxyl. Determinations of the -OMe contents of the woods after extraction with an alcohol-benzine mixture (1 : 1) and of the extractions showed a very slight decrease in both the wood and the extract with increasing stages of red rot, while in the case of dry rot there was an increased percentage by weight of -OMe both in the wood and the extract; however, the percentage of -OMe by volume was decreased in the wood attacked by *M. lacrymans*. Assuming that the extracted wood contains only lignin-bound -OMe, the -OMe contents of the extracted wood and isolated lignin should correspond. However, since the -OMe content of the lignin obtained by Urban's method (*Ber. Deutsch. Chem. Gesellsch.*, lx, p. 231, 1927) was about 6 per cent. lower than that from extracted wood (only 3 per cent. in the case of wood severely attacked by dry rot), three kinds of lignin are differentiated, viz., that occurring in sound, red-rotted, and slightly dry-rotted wood; that found in badly dry-rotted wood; and that obtained by Urban's method.

Neill (J. C.). **Dry-rot of Swedes. Some field observations and experiments on control.**—*New Zealand Journ. of Agric.*, xxxix, 2, pp. 86–93, 5 figs., 1929.

Some details are given of observations and field experiments from 1927 to 1929, inclusive, in different parts of New Zealand,

on the dry rot of swedes [*Phoma lingam*: *R.A.M.*, viii, p. 691]. It was found that swede seed is as effectively disinfected by steeping it for one hour in a 0·25 per cent. solution of semesan at 50° to 60° F., and then dipping it for five or ten minutes in the same solution at 115°, as by Cunningham's method [ibid., vii, p. 70], the new method having the advantage of being easier to carry out and of being quite harmless to the vigour of germination of even weak seed. Although laboratory tests of some 95,000 seeds by Cunningham's plating method showed that not one of the treated seeds gave a growth of the dry rot organism, the large majority of the crops raised from the disinfected seed developed the disease in the field, indicating that either the laboratory tests were inadequate or that the crops became infected from some external source. It is pointed out that the contingency of the infection arising from a previous swede crop or from cattle droppings had been carefully guarded against in most of the field experiments.

Experiments were carried out to test the effect of thinning out the stands and of roguing out diseased individuals on the spread of dry rot. Swedes were sown in a plot on land bearing part lucerne and part grass, and which had not carried species of *Brassica* for at least seven years, on 6th November, 1928, in rows 2 feet apart, and the stands were thinned out at the end of the same month. Frequent inspections failed to reveal any dry rot until 15th January, when six plants showing typical leaf lesions were found at rather widely scattered spots. By the 8th February bulb lesions were becoming common in the vicinity of these, and an attempt was then made to stamp out the disease by the removal of all infected plants, the position and date of removal of each being carefully noted. The ensuing spread of the disease [which is graphically shown in a plan of the plot] was not appreciably affected by this measure. There was some evidence that the spread of infection was helped by the handling of the plants during the frequent inspections, but a study of the spread week by week strongly suggested that insects, which are attracted by spore-producing lesions, are the main disseminators of the disease. In another plot, on an old pasture and some two miles distant from the first, the swedes were sown on 8th December, 1928. The crop was not thinned, was hand-hoed once only between the rows, and inspected twice, when no dry rot lesions were found. On the final examination on 8th May, seven diseased swedes were found around a central infection focus, represented by a completely rotted bulb and a partially rotted bulb adjoining the first; the seven diseased plants only bore small lesions at old leaf scars on the collar, which are considered to be almost certainly secondary infections caused by spores.

Kovačevski (I. C.). Етиология на Фасулевата бактериоза въ България. [Etiology of the bacterial diseases of Beans in Bulgaria.]—*Yearbook Univ. of Sofia, Fac. of Agric.*, vii (*1928–29*), pp. 429–444, 1929. [English summary.]

The cultivation of French beans [*Phaseolus vulgaris*] in Bulgaria is stated to be gravely handicapped by the prevalence of two bacterial diseases, the symptoms of which are similar to those of

bacterial wilt and bacterial blight in the United States. Isolations from diseased plants yielded three bacteria, one of which is saprophytic, while the other two have been shown by inoculations to reproduce the diseases under controlled conditions. A morphological and cultural study of the two organisms [details of which are given] showed that they are indistinguishable from *Bacterium phaseoli* [*R.A.M.*, vii, p. 495] and *Bact. flaccumfaciens* [ibid., vii, p. 215], respectively. Both species are frequently carried in the bean seeds, but experiments made to test the possibility of controlling them by treating the seed by dry heat gave very unsatisfactory results, since both resisted a treatment consisting in drying the seed at 52° for 20 hours, then heating it at 75° for a further 20 hours, and finally raising the temperature to 85° for 3 hours. All the native varieties of French beans are susceptible to both diseases, but the pea bean variety showed a relative resistance to *Bact. phaseoli*.

MARCHAL (E.). **Les maladies cryptogamiques de la Betterave.** [Cryptogamic diseases of the Beetroot.]—*Sucrerie Belge*, xlviii, 23, pp. 449–457, 1929.

Notes are given on the distribution, symptoms, and control of a number of fungous and physiological diseases of the sugar beet, with special reference to Belgian conditions. Blackleg is due, at any rate in Belgium, primarily to *Phoma betae*, though *Bacillus mycoides*, *Pythium de Baryanum*, and *Hypochnus* [*Corticium*] *solani* may also be involved. This disease is scarcely ever found in soils with a hydrogen-ion concentration of P_H 7·5 (the optimum for beetroot development). Good control is stated to have been given by dusting the seed-clusters with 8 to 10 per cent. basic copper carbonate. Seed disinfection has been known to result in an increase of 0·2 to 0·5 per cent. in the sugar content.

Mildew (*Peronospora schachtii*) generally occurs only in a sporadic form in Belgium.

Leaf spot (*Cercospora beticola*) usually develops towards the close of the growing period and causes no appreciable damage.

Yellows [mosaic: *R.A.M.*, vi, p. 591] appears to be increasing in prevalence, but an examination of affected leaves at Gembloux showed no appreciable reduction of their assimilatory activity.

ESMARCH (F.). **Der Gürtelschorf der Rüben.** [Girth scab of Beets.]—*Die Kranke Pflanze*, vi, 8, pp. 145–147, 1 fig., 1929.

Popular notes are given on the symptoms and etiology of girth scab of beets (*Actinomyces* spp.) [*R.A.M.*, ix, p. 10], the losses from which have been estimated by Krüger (1905) as approximating to 75 cwt. per acre in severe cases. The sugar content of diseased beets is 1 to 5 per cent. lower than that of healthy ones. The zone of infection generally begins at soil level and extends downwards towards the tail of the beet. Numerous verrucose protuberances, resulting from callus formation, and also deep longitudinal fissures, may be observed on the diseased parts. The cortical tissue is partially or wholly destroyed and replaced by cork, but the vessels remain unaffected. Heavy applications of lime appear to reduce the incidence of girth scab, presumably by promoting the aeration

of the soil and thereby impeding the development of the causal organisms.

Appel [O.]. **Neue Erfahrungen und Forschungen auf dem Gebiete der Rübenkrankheiten.** [New experiments and investigations in the Beet disease field.]—*Deutsche Zuckerind.*, liv, 31, pp. 845–849, 1929.

In this paper, read before the German Sugar Industry Association at Dresden on 30th May, 1929, the latest information regarding a number of sugar beet diseases and pests is summarized and discussed. In connexion with root rot (*Phoma betae*, *Aphanomyces levis*, and *Pythium de Baryanum*), it is stated that, owing to the unsatisfactory results of chemical treatment [*R.A.M.*, viii, pp. 418, 543], preparations aiming at the control of this disease will no longer be tested by the German Plant Protection Service, except at the special request of the manufacturers.

Some progress has been made in the development of measures for the extermination of the leaf bug *Piesma quadrata* [*Zosmenus quadratus*], which is responsible for the transmission of the curl disease of beets [ibid., vii, p. 692]. The cost of the apparatus and material (an insecticide known as Ri 26) for the extermination of the insects is estimated at M. 21·21 per strip measuring 100 by 4 m. The loss caused by the disease over an area of 2 hect. approximates to M. 300, so that the economic advantage of the treatment is considerable.

Brief notes are also given on girth scab [*Actinomyces* sp.: see preceding abstract] and leaf spot (*Cercospora*) [*beticola*].

Wille (J.). **Die Rübenblattwanze Piesma quadrata Fieb.** [The Beet leaf bug *Piesma quadrata* Fieb.]—*Monogr. zum Pflanzenschutz*, 2, 116 pp., 39 figs., J. Springer, Berlin, 1929. [Abs. in *Fortschr. der Landw.*, iv, 22, p. 736, 1929.]

In this monographic study of the beet leaf bug (*Piesma quadrata*) [*Zosmenus quadratus*], the insect vector of curl disease of beets [see preceding abstract], attention is drawn to the occurrence of the leaf curl disease on mangolds, spinach, and sorrel [*Rumex acetosa*]. The disease is transmissible only by adult insects. The virus is not carried in the seed, nor is it transmissible from the bugs to their progeny, but must be acquired afresh by each individual.

Müller (K. R.). **Eine neue Rübenkrankheit.** [A new Beet disease.]—*Deutsche Landw. Presse*, lvi, 33, pp. 469–470, 5 figs., 1929.

In August, 1929, the writer investigated, in the laboratory and in the field, an apparently new disease of sugar and fodder beets occurring in various localities of the Halle district. The pronounced curling of the leaves and breaking of the veins at first suggested invasion by the leaf bug, *Piesma quadrata* [*Zosmenus quadratus*: see preceding abstracts], but no trace of the insects could be found. A cicada detected on the petioles was identified as *Chlorita flavescens*.

In many respects the German beet disease resembles the American

curly top, the insect vector of which is *Eutettix tenella* [*R.A.M.*, viii, pp. 693, 694]. The affected plants (which may be in immediate proximity to healthy ones) are readily recognizable by the abnormally prolific development of heart leaves with small leaf blades and shortened petioles, giving a tufted appearance. The inner leaves usually show wart-like, very slightly elevated, inconspicuous protuberances at the above-mentioned breaks in the veins on the under side. These swellings, which are covered with necrotic tissue, also occur on the petioles. Diseased leaves are somewhat darker in colour than healthy ones (never chlorotic) and their tissues abnormally brittle. The transparency of the veins and formation of conical structures on the leaves, associated with the American form of curly top, were not observed in the German material. By holding the latter up to the light, elongated, dark areas became visible in the main, and more rarely also in the accessory veins, the microscopic examination of which disclosed the presence of disturbances including a brown discoloration of the sieve-tubes and their companion cells. The outer leaves are generally normal or only slightly curled. Hitherto the disease has produced no very striking effects on the stand, but an arrest of growth of the roots, in consequence of the withdrawal of foodstuffs for the over-developed heart leaves, is certainly to be expected.

The cause of the German beet disease is believed to be a virus, which may or may not be carried by *C. flavescens*.

Woodward (R. C.) & Dillon Weston (W. A. R.). **Disinfection of Sugar Beet seed.**—*Brit. Beet Grower*, ii, 12, pp. 319–321, 1929.

The writers state that the fungus isolated from the English sugar beet seedlings suffering from blackleg referred to in a previous communication [*R.A.M.*, viii, p. 543] has been identified, from comparison with Dutch material, as *Phoma betae*.

Sedlmayr (C. T.). **Erfahrungen bei der Bekämpfung der Cercospora in Ungarn.** [Experiments in the control of *Cercospora* in Hungary.]—*Fortschr. der Landw.*, iv, 13, pp. 416–418, 1929.

Excessively heavy losses (5,000 to 8,000 kg. per hect.) are stated to have been caused in the Hungarian beet crop during the period 1924 to 1927 by leaf spot (*Cercospora beticola*) [*R.A.M.*, viii, p. 696], and the problem of controlling this disease has become acute. Good results have been obtained by the application of 2 per cent. Bordeaux mixture by means either of the portable Kühne (Moson) machines or the Agrarglobus (Budapest) hand sprayers. Allowing for the cost of material, labour, depreciation, &c., the average gain from the treatment is estimated at 2,000 kg. per hect. [ibid., viii, p. 350].

Hansen (H. N.). **Etiology of the pink-root disease of Onions.**—*Phytopath.*, xix, 8, pp. 691–704, 5 figs., 1929.

A full account is given of the writer's investigations, begun in 1925, on the etiology of pink-root of onions [the macroscopic and microscopic symptoms of which are described: *R.A.M.*, viii, p. 623].

In order to determine the relative virulence of *Fusarium malli*, *F. cromyophthoron*, *F. rhizochromatistes*, *F. moniliforme* [*Gibberella moniliformis*], and ten other strains of *Fusarium* isolated from diseased onion roots at Davis, California, each of these organisms was inoculated into 15 pots of greenhouse soil which were subsequently planted with sterilized Yellow Globe Danvers onion seed and maintained at a temperature of 25° to 28° C. Forty days after germination the root systems of the seedlings grown in the inoculated pots were found to be entirely normal. The experiment was repeated with *F. malli* and *F. cromyophthoron*, again with negative results. In May, 1926, heavily infected roots of young, growing onions in various localities of California yielded several species of *Fusarium* and one of *Phoma*, the latter alone being isolated from pink roots in the early stages of the disease. The mycelium of the *Phoma* was inoculated into eight Erlenmeyer flasks containing clean sand wetted with nutrient solution, each planted with four onion seeds. Ten days after germination many of these seedlings showed typical symptoms of pink-root and in a month all were dead; the controls remained healthy. The fungus was reisolated from the diseased onion remains and sand.

In another test sterilized Ebenezer onion bulbs were grown in nutrient solution inoculated with *Phoma* sp., *F. malli*, and *F. cromyophthoron* (six of each). Positive results were obtained in all cases with the *Phoma*, and negative with the others. The outcome of a further experiment, in which onion bulbs were similarly inoculated with the *Phoma* alone, and with the *Phoma* and *Fusarium* spp. together, showed that in the latter case decay was more rapid and complete than where *Phoma* only was implicated. Under Californian conditions, therefore, pink-root of onions appears to be initiated by the *Phoma* and considerably intensified by the secondary action of *Fusarium* spp.

The best growth of the *Phoma* is made at about 26°, this point coinciding with the highest percentage of infection and also, possibly, with the maximum host development.

The morphological and cultural characters of the pink-root fungus are described. The subglobose, ostiolate, papillate, dark brown to black, carbonaceous pycnidia measure 170 to 350 μ in diameter. The continuous, hyaline, oblong-ovoid, biguttulate conidia, 4·5 to 5·5 by 1·8 to 2·3 μ, escape as a gelatinous mass through ruptures, rarely as a tendril through the ostiole. The colour of old cornmeal agar cultures ranged from rose-pink to rose lane purple. Pycnidial formation is preceded by conglomerate masses of dark, thick-walled bodies resembling chlamydospores and occurring naturally in the cells of diseased onion roots, which apparently never contain mature pycnidia. These bodies are thought to represent a resting stage of the fungus, which is considered to differ sufficiently from the other species of *Phoma* parasitic on roots to justify recognition as a new species, which is named *P. terrestris*. Cultures obtained from Wisconsin and Bermuda closely resembled those isolated in California, indicating that the fungus is widely distributed. It has further been found in Texas on onions, cowpeas, Lima beans (*Phaseolus limensis*) [*P. lunatus*], and potato seed pieces.

Machacek (J. E.). **The black mould of Onions caused by Aspergillus niger v. Tiegh.**—*Phytopath.*, xix, 8, pp. 733–739, 4 figs., 1929.

During the autumn of 1928 the writer examined 40,000 cases of Spanish onions, imported into Canada from Valencia, Spain, in order to determine the extent and cause of an epidemic of black mould which greatly reduced their market value. Infection with *Aspergillus niger* [*R.A.M.*, vi, p. 466] was found in each of the cases and ranged from 10 to 100 per cent. In addition *Erwinia carotovora* [*Bacillus carotovorus*] was found on some of the rotted bulbs.

In most cases the initial invasion by the fungus appeared to begin at the neck of the onion at the time when the leaves died, later penetrating slowly into the interior of the bulb or spreading in the form of black streaks below the outer dry scales. Most of the bulbs showed an open space extending from the base of the neck to varying depths inside the bulb and usually lined with the dried tops of the scales, thus providing a suitable habitat for a weak parasite such as *A. niger*. The minor rot initiated by the latter often formed a basis for the more destructive and extensive rot due to *B. carotovorus* [cf. ibid., viii, p. 591].

Superficial infection of the bulbs is characterized by the formation of shallow lesions on the outer scales, by streaks of black fungous growth, and by discoloured, irregular areas.

The disease appears to be confined to Spanish onions, probably owing to the top and centre of the bulbs remaining open to infection. The incidence of infection may be reduced by seed and sett disinfection and by careful handling at harvest time and in transit to avoid bruises. The bulbs should be stored under cool, dry conditions.

Janson (A.). **Ringelkrankheit des Meerrettich.** [Girdle disease of Horse-Radish.]—*Gartenwelt*, xxxiii, 37, pp. 512–513, 1 fig., 1929.

An obscure disease of horse-radish, which threatens to assume considerable economic importance, is becoming increasingly prevalent in Germany, though it is said to have been known for more than 30 years. The first severe attacks generally occur about 20th July, when the outer leaves rapidly die off. The hearts remain sound, but their growth is markedly arrested. The vascular bundles turn pale yellow, then brownish, and finally almost black. The affected plants are quite unsaleable. The disease has been observed to occur in soils containing ferrous oxide and receiving heavy applications of lime and marl. Chemical analyses have shown that the sulphuric acid content of horse-radish is exceptionally high, while its potash requirements appear to exceed that of any other plant except celery. At present the only known measure of control is to rest diseased soils for at least four or five years.

Rodda (T. E.). **Stationary spraying system for vineyards.**—*New Zealand Journ. of Agric.*, xxxix, 2, pp. 94–96, 1 diag., 1929.

Following the increasing popularity attained in New Zealand by

the stationary or pipe system of spraying in orchards [*R.A.M.*, v, p. 236; viii, p. 658], a similar system has been installed in a 20-acre vineyard of the Te Kauwhata Horticultural Station. The system consists of main lines of pipes running underground at the lower end of the vine rows, and of lateral lines laid on the top of every eleventh row of vine props, which are 3 ft. 6 in. high. Taps to connect the spraying hoses are placed on each lateral, the first at 84 ft. from the main line, and the others at intervals of 168 ft. apart. Galvanized $\frac{3}{4}$ in. piping is used for all the main lines and for an average of one-third of the length of each lateral line, the remainder being $\frac{1}{2}$ in. The electrical driving plant consists of a three-cylinder pump, with a capacity of 16 gallons per minute at 500 lb. pressure.

The system gave entire satisfaction during the whole of the 1928 season; it maintained a steady pressure of 250 lb. per sq. in. at the gauge, which is considered sufficient for vineyard spraying, since efficient work was obtained at 500 yards from the pump, the most distant point tested. Four men were employed spraying at one time, but it is believed that sufficient spray could have been delivered at the nozzles to keep eight men occupied.

A brief description is also given of the method of attaching and handling the spraying hoses. The main advantages of the system are that the spray can be applied when soil conditions are such as to render the use of horse-drawn gear impossible or difficult, that it avoids packing of wet clay soils, and that it enables the sprays to be applied quickly and at the correct time.

Marsais (P.). **Contre les traitements tardifs des grappes à protéger du mildiou et des vers.** [Against late treatments of Grape clusters for the control of mildew and insects.]—*Rev. de Vitic.*, lxxi, 1831, pp. 69–73, 1929.

As tests made with numerous sprays [the composition of which is indicated] used against insect pests and mildew of the vine [*Plasmopara viticola*] showed definitely that late applications of copper sulphate mixtures containing arsenic or nicotine adversely affected the quality of the wine, especially if they were very adhesive, these should not be given to vines of which the produce is used in the preparation of the more delicately flavoured wines.

Astruc (H.). **Traitements d'été contre le mildiou.** [Summer treatments against mildew.]—*Rev. de Vitic.*, lxxi, 1831, pp. 73–76, 1929.

The author states that the best summer treatment of vines against mildew [*Plasmopara viticola*] is given by very finely pulverized cupric dusts, which penetrate to all parts of the fruit clusters and are much more speedily applied than are fluids. To avoid leaf scorching the dusts should not contain more than 10 per cent. copper, which entails applying 40 to 50 kg. of dust per hect. (as against 4 or 5 hl. of liquid for the same area), in order to ensure a sufficient covering of copper and compensate for losses due to wind and rain, and for the slightly reduced adhesiveness of dusts as compared with fluids. The amount of copper used in one liquid application suffices for at least two dust treatments. From

July onwards dusting should constitute the principal means of control, liquid applications being supplementary; the copper concentration of the latter may then be reduced and the copper so saved employed in dust form. No calcareous substance should be used to dilute the dust, as calcium may render the copper insoluble. The copper should be employed at the rate of 8 per cent. of copper sulphate crystals, equivalent to 2 per cent. of metallic copper.

A comparative test in which three equal parts of a vine were given, respectively, no treatment, 7 liquid applications, and 5 liquid and 4 dust applications (which were made alternately after 15th June) showed that the yields obtained were, respectively, 5, 12, and 20 kg., approximately.

G. (A.). **Briciole. Gli osservatorî antiperonosporici nella Prov. di Alessandria ed i risparmi che permettono di conseguire.** [Notes. The anti-mildew observatories in the Province of Alessandria and the economies effected through their agency.] —*Il Coltivatore*, lxxv, 22, pp. 117–118, 1929.

The author states that 53 forecasting stations to warn vine growers against impending attacks of *Peronospora* [*Plasmopara viticola*] have now been established in the province of Alessandria [*R.A.M.*, viii, p. 150], where their services are proving of great value. Each station consists of a rain-gauge and a shuttered screen containing a maximum and minimum thermometer and a hygrometer. The observers record the daily variations in the weather and draw up a monthly bulletin.

During 1929 the temperature did not reach the minimum necessary for infection until the end of May, by which time growers had been saved at least three applications of copper sulphate. Towards the end of July growers in the vicinity of a station had given only three or four treatments whereas others had made six or seven.

Borg (P.). **Appendix F. Report of the Plant Pathologist.**— *Repts. on the Working of (Malta) Govt. Depts. during the financial year 1927–28*, pp. T 15–T 16, 1929.

Vines in Gozo were severely attacked during the period under review by downy mildew (*Plasmopara viticola*) which also occurred in a milder form in Malta [*R.A.M.*, ii, p. 536]. Both this disease and potato blight (*Phytophthora infestans*) were controlled to some extent by spraying.

[It is stated on p. T 4, in the report on the working of the Department of Agriculture, by J. Borg, that the White Beauty of Hebron potato variety is showing an increasing tendency to degeneration as a result of leaf roll. This report contains various other scattered items of phytopathological interest.]

Work connected with insect and fungus pests and their control. Progress in chief industries.—*Rept. Agric. Dept., St. Vincent, for the year 1928*, pp. 8–18, 1929.

The damping-off of young cotton plants caused by *Sclerotium rolfsii* [*R.A.M.*, vii, p. 618] was prevalent in fields where cultural operations were neglected. The cotton yield was much reduced by

soft rot (*Phytophthora* sp.), causing wholesale destruction of the bolls during the latter part of the year. Rain fell on 59 out of the 61 days in November and December, providing ideal conditions for fungous growth.

WEBER (G. F.). **Plant pathology.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1928*, pp. 65 R–78 R, 1928. [Received January, 1930.]

Good control of citrus melanose [*Phomopsis citri*: *R.A.M.*, viii, p. 378] was given by the application of 4–4–50 Bordeaux mixture in conjunction with oil sprays. The latter, however, caused considerable spotting or 'shadowing', an unsightly blemish which was not removed by the washing and drying of the fruit previous to packing. The optimum and maximum temperatures for the development of *Bacterium* [*Pseudomonas*] *citri*, the causal organism of citrus canker [see below, p. 175], have been determined as 28° to 30° and 40° C., respectively. Growth occurred at 10°, the lowest temperature tested. Five minutes' exposure to a temperature of 48° killed the organism in broth, and it was also destroyed in culture tubes by hydrogen peroxide in 30 seconds or less. The inoculation of healthy leaves with a filtrate of *P. citri* produced no noticeable effect. Kumquats [*Fortunella* sp.] proved somewhat resistant to canker in inoculation tests. A total of 277 citrus trees previously treated for psorosis and gummosis [the term gummosis is often used in Florida when referring to the psorosis disease: ibid., viii, p. 640] were inspected at Cocoa and re-treated in a few cases. It was found that dry lime-sulphur ($\frac{1}{4}$ lb. in 2 qt. water) gave very good control of this disease, as also did the usual scraping methods followed by the application of a paste consisting of equal parts of dusting sulphur and hydrated lime with a small amount of water.

Clitocybe tabescens has been found killing the common guava [ibid., vi, p. 518], Cattley guava (first record), and Australian pine [*Callitris* sp.], while in one case it was observed to be infecting a peach tree from an adjacent guava.

Inoculation experiments with *Mycosphaerella fragariae*, the causal organism of strawberry leaf spot [ibid., viii, pp. 118, 120] showed that the Missionary variety is not resistant to this disease where conditions favour its development. Control was effected by spraying with Bordeaux mixture 4–4–50. The incubation period of the strawberry leaf blight organism (*Dendrophoma obscurans*) [ibid., vii, p. 176] was found to be ten days. This disease, which is more common in Florida than leaf spot, is also controllable by two applications of Bordeaux mixture. A pathological condition of the roots, usually in the form of a rot, causes considerable damage to the strawberry plantings every year [cf. ibid., vii, p. 525], and is thought to be of physiological origin.

Empusa fresenii, the fungus attacking the citrus aphid [*Aphis spiraecola*: ibid., v, p. 522], has also been found infecting the melon aphid [*A. gossypii*], the brown citrus aphid [? *Toxoptera aurantiae*], and the grape aphid. The perpetuation of the disease apparently depends on whether or not the aphids killed by the fungus die on heavily infested trees.

Department of Botany.—*Forty-second Ann. Rept. Pennsylvania Agric. Exper. Stat. for the fiscal year ending June 30, 1929* (*Bull.* 243), pp. 13–16, 1 fig., 1929.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, viii, p. 90], contains, among others, the following items of phytopathological interest. Several hundred pear trees either highly resistant to or immune from fireblight [*Bacillus amylovorus*] were propagated for immunity studies, several being self-rooted for propagation and resistant root trials. One chance seedling proved to be very resistant, an excellent grower, and quite hardy during winter.

An attempt was made to follow the growth of *Bacterium leguminosarum* from its first entry into soy-beans, and to note its effects on the tissues through which it passed. So far it appears that in its early invasion the organism migrates as inter- and intracellular zoogloeae, while in later stages the organism becomes intra-cellular [cf. ibid., viii, p. 250]. It enters the cells through cavities in the walls, made, apparently, by the dissolving power of the zoogloeae. Nuclear and cellular enlargement, accompanied by a multinuclear condition, rapidly follows cellular invasion. The migration of *B. carotovorus* in carrot tissue was also studied, and it was found that the bacteria in this case also invade the intercellular spaces as zoogloeae. The tips of the latter were not often seen on account of the very compact nature of the tissue. The zoogloeae split the cell walls in the region of the middle lamella and plasmolyse the cells by enzyme action.

Experiments with glass compared with cloth as covers to tobacco seed-beds showed that covering with glass checked the development of wildfire [*Bact. tabacum*], even when infectious material was introduced, though broken or ill-fitting sashes sometimes allowed it to appear. Mercury compounds appeared to give some control, but occasionally retarded the growth of the plants. Seventeen trials were made to ascertain whether wildfire was disseminated by insects, 25 or more insects in each test being fed on infected leaves and then placed on healthy plants. A few spots of infection appeared in one test. Dry leaves preserved indoors, stems piled outside stripping sheds, and stems overwintered in the field are sources of infection in the seed-beds in descending order of importance. Clean crops of tobacco were grown under shade tents from disease-free seedlings, although diseased tobacco plants were growing just outside.

LEEFMANS (S.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1928.** [Diseases and pests of economic crops in the Dutch East Indies in 1928.]—*Meded. Inst. voor Plantenziekten*, 75, 96 pp., 1929.

Among the many items of phytopathological interest in this report (prepared on the usual lines) [*R.A.M.*, viii, p. 225], the following may be mentioned. A further extension of the obscure ['foam'] disease of citrus resembling the Philippine bark rot [ibid., viii, p. 226] has been observed in the Oost-Priangan Residency of Java. The condition is regarded by the native

population as a feature of senescence, and no special measures are adopted for its prevention.

Maize suffered severely from downy mildew [*Sclerospora javanica*: ibid., vii, p. 308] in Semarang and other districts, the losses often amounting to 50 per cent. of the crop. Infection was favoured by the sudden onset of an exceptionally heavy rainfall in November and December.

The rice crops in Semarang, Rembang, and Soerabaja were heavily damaged by root rot or 'omo mentek' [ibid., vii, p. 394], which occurred over areas of 7,416, 33,693, and 3,801 hect., respectively, in the three Residencies. The losses from this disease, the severity of which was accentuated by adverse weather and soil conditions, amounted to 20 and even 50 per cent. in some fields. Rice grown under dry conditions in Bodjonegoro was again attacked by *Pythium* [ibid., viii, p. 225].

The red rot fungus (*Ganoderma pseudoferreum*) was prevalent in old *Hevea* rubber plantations in west Java. Mildew [*Oidium heveae*: ibid., ix, p. 91] was more severe in most parts of the country than during previous years, infection being unusually heavy in low-lying plantations which are generally almost free from the disease. In Besoeki the yield of the rubber trees was reduced by 10 per cent. in some plantations where mildew was very virulent, but in general the damage to the leaves was somewhat slighter than in the previous year.

Cinchona on the west coast of Sumatra was attacked by *G. pseudoferreum*; *Armillaria mellea* was observed once on this host in Java and *Rosellinia* sp. was prevalent as usual [ibid., vii, p. 308]. In south Sumatra the *Cinchona* plantations were attacked by *Rhizoctonia bataticola* [*Macrophomina phaseoli*].

At the end of 1928 the top die-back of coffee [ibid., ix, p. 91] was observed for the first time in central Java.

Notwithstanding the record sugar-cane harvest of 1928 there are indications that the principal variety, P.O.J. 2878, failed to reach maturity during the continuous heavy rains, especially in damp localities and on permeable soils. This variety is highly resistant both to mosaic and sereh disease [ibid., viii, pp. 667, 809], neither of which is any longer of practical significance in Java. Red stripe disease [*Phytomonas rubrilineans*: ibid., viii, p. 404] affected most of the new P.O.J. varieties, especially 2947. P.O.J. 2878, 2952, and 2946 are also susceptible to red stripe, but usually outgrow its effects. Gumming [Java gum disease (*Bacterium albilineans*): ibid., viii. p. 465] occurred in a serious form in low-lying plantations. Root rot was observed on the susceptible E.K. 28 variety in a number of plantations which were hitherto free from this trouble; in most cases P.O.J. 2878 was substituted. Pokkah boeng [*Gibberella moniliformis*: ibid., viii, p. 670] was prevalent in the 1927–8 crops, but the damage due to this cause was less serious than in the previous year. P.O.J. 2878 appears to be more susceptible to pokkah boeng than its predecessors. There was a decrease in the incidence of top rot [ibid., vii, p. 537]. Canes of the P.O.J. 2878 variety affected by this condition must be abandoned as hopeless, especially where their natural tendency to poor development of the lateral eyes is accentuated by attacks of

pokkah boeng. Other diseases recorded on sugar-cane were a form of wilt among seed canes, and a condition resembling gumming but microscopically and bacteriologically distinct.

G. pseudoferreum and *Rosellinia arcuata* [ibid., viii, pp. 267, 611] were the most prevalent fungi on tea and various green manures in central Java, the former occurring also in south Sumatra.

Soru (Eugénie). **Agglutination par les acides et potentiel électrique du Bacillus tumefaciens.** [Acid agglutination and electric potential of *Bacillus tumefaciens*.]—*Comptes rendus Soc. de Biol.*, ci, 24, pp. 969–970, 1929.

When agar cultures of *Bacillus* [*Bacterium*] *tumefaciens* were exposed [by a method which is briefly indicated] to the action of hydrogen-ion concentrations ranging from P_H 0·89 to 8·2, it was found that the 'critical potential' (*Zeitschr. Physiol. Chem.*, lxxxix, p. 186, 1914; *Journ. Gen. Physiol*, p. 63, 1924) lies between P_H 5·7 and 6·9, at which range agglutination is also most active [cf. *R.A.M.*, viii, p. 429]. Within this range the critical potential is equivalent to 17·95 millivolts. Above and below this critical zone the potential increases (up to 79·73 at P_H 1·20 to 2) and agglutination no longer takes place.

Thung (T. H.). **Experimenten met Bacterium tumefaciens Sm. et Towns.** [Experiments with *Bacterium tumefaciens* Sm. et Towns.]—*Tijdschr. over Plantenziekten*, xxxv, 10, pp. 263–269, 1 pl., 1929. [English summary.]

Inoculation experiments with *Bacterium tumefaciens* on the rootstock of a standard French variety of celery resulted in the development of tumours which gave rise to malformed leaves and roots. Attempts to immunize *Ricinus communis* against *Bact. tumefaciens* by means of a vaccine prepared from the organism gave negative results. Bouillon cultures of *Bact. tumefaciens*, 3, 8, 14, and 24 days old, yielded no toxins producing a comparable result on the plants to those given by the organism itself. Contrary to the observations of D'Hérelle and Peyre (*Comptes rendus Acad. Sci.*, clxxxv, p. 227, 1927), even ultra-pure cultures of *Bact. tumefaciens* proved capable of inducing tumour formation, which the writer, in agreement with Magrou (*Le Cancer*, 1, 1928), believes to be due to the action of mitogenetic rays.

Bunting (R. H.). **Defective Cacao.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 37–43, 4 pl., 1929.

One of the most serious defects of fermented cacao beans exported from the Gold Coast is that caused by the presence of internal moulds [*R.A.M.*, viii, p. 28], belonging predominantly to nine species [illustrated by an excellent coloured plate], viz., *Aspergillus glaucus* group (probably *A. chevalieri*), *A. fumigatus*, *A. tamarii*, *A. flavus* [ibid., vii, p. 94], *A. ochraceus*, *Penicillium* sp., *Mucor* sp. (cymose), *Absidia regneri*, and *Circinella spinosa*. Investigations have shown that this source of damage can be

almost entirely avoided by thorough drying of the produce and keeping it from any contact with fresh or salt water, either of which favours the development of the moulds, practically every bean being contaminated with spores of one or more of these fungi before it leaves the producers' hands.

BUNTING (R. H.). **Fungi occurring in Cacao beans.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 44–57, 6 pl. (1 col.), 1929.

This is a general classification [illustrated by original drawings] of the internal moulds of cacao beans exported from the Gold Coast [see preceding and next abstracts] into the following groups. I. Thermophilic moulds, including *Aspergillus fumigatus* and the cymose species of *Mucor* [stated by Lendner to be apparently a new species]. II. Hygrophilic moulds, comprising *A. niger*, *A. tamarii*, *A. flavus*, *A. ochraceus*, *Circinella spinosa*, *Absidia regneri*, and *A. capillata*. III. Moulds occurring on commercially dry cacao beans, namely *A. glaucus* group (probably *A. chevalieri*) and *Penicillium* sp. Each species is described and figured.

DADE (H. A.). **Internal moulding of prepared Cacao.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 74–100, 5 pl., 1 diag., 6 graphs, 1929.

Investigations have been conducted on various aspects of the internal moulding of prepared cacao exported from the Gold Coast [see preceding abstracts] with a view to its prevention. The points investigated were (1) the conditions permitting the occurrence of moulding; (2) the circumstances and phases in the history of the product in which such conditions obtain; (3) the mode of internal infection; (4) the stage at which such infection takes place; and (5) the identity and properties of the fungi concerned.

The results showed that the conditions favouring the development of moulding in cacao beans are the existence of a nutritive substratum, suitable temperature, and an adequate water supply, of which the last-named is the most important. Suitable food material is found in the cell contents of the embryo and in the residue after evaporation of the juices inside the freshly fermented beans. Laboratory experiments have shown that the latter material alone is sufficient to support a growth of mould rendering the beans commercially 'mouldy'. The import regulations of the United States (one of the largest purchasers of Gold Coast cacao), prohibiting the importation of material containing more than 10 per cent. of mouldy beans, are based on the assumption that the mere presence of mould on raw cacao (quite apart from actual damage to the embryo, which seldom occurs in practice) is injurious to the consumer. The temperatures to which the cacao beans are subjected, throughout most of their passage from the producer to the port of entry, are highly favourable to the development of the moulds involved, ranging from 25° to 54° C. in the fermentation heap and 25° to 35° or above in storage. In tropical and subtropical latitudes, and possibly also in higher ones, the temperature of ships' holds is also suitable for fungous growth.

The results [which are fully discussed, tabulated, and expressed by graphs] of a series of experiments to determine the minimum water content permitting mould growth showed that a fungus of the *Aspergillus glaucus* group (probably *A. chevalieri*) [loc. cit.] is the most common commercial mould, developing at a lower water content (8 to 9·5 per cent.) than the other organisms concerned. In determinations of the degree of dryness necessary to prevent moulding, the percentage of moisture permitting the growth of *A. chevalieri* is therefore critical. The cacao beans should be dried to and retained at 8 per cent. water content. Damage to the shells by husking knives, insect pests, and cracking in very dry material facilitates the penetration of the beans by mould fungi.

The results of studies on the mode of internal infection of cacao beans indicated that *A. fumigatus*, *A.* (?) *chevalieri*, and probably the cymose species of *Mucor* previously mentioned [loc. cit.], tentatively referred to as *M.* (*Cymomucor*) n. sp. 463, are able to penetrate the testa in the region opposite the radicle. The susceptibility of this part of the testa may be due to changes effected by enzymatic action during incipient germination in the early stages of fermentation. These fungi are the most important agents in the causation of internal moulding. Both *A. fumigatus* and *A.* (?) *chevalieri* are very commonly found in mouldy cacao beans, but are frequently overgrown by other moulds when the water content of the cacao is relatively high. These fungi, as well as *Mucor* 463, prepare the way for the entrance of other moulds which are unable to penetrate the testa without assistance; *A. tamarii* and *A. flavus*, for instance, cannot secrete enzymes enabling them to dissolve the cell walls.

Infection by *A. fumigatus*, and probably also by *Mucor* 463, occurs during fermentation at least in some proportion of the fermenting mass (30 per cent. in one batch of native-prepared cacao beans examined). Internal infection by other moulds occurs during drying when this process, as often happens, is delayed by the rains of September, October, and November—an important period in cacao preparation. Internal moulding may also develop in inland transport if the cacao is wetted by rain, or it may occur during storage through the absorption of atmospheric moisture. It has been found that a store, e. g., that of Aburi, with an average daily humidity of over 82 per cent. saturation is unsafe for the protracted storage of cacao.

Complete and immediate control of internal moulding of cacao is obviously impracticable, but a considerable reduction in the incidence of infection may be obtained by various simple methods [which are briefly outlined] of avoiding the predisposing causes discussed above. It is further suggested that continuously recording hygrometers should be used to obtain definite information on the atmospheric humidity of the cacao stores. Directions are also given for the application of a simple method of testing the dryness of cacao, based on the equilibria existing between atmospheric humidity and water content, and on the colour change (from blue to pink) taking place as dry cobalt chloride absorbs moisture from the air.

Dade (H. A.). **Further notes on cushion canker of Cacao.**— *Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 135–139, 2 pl. (1 col.), 1929.

In a further study on the course of infection in cushion canker of cacao (*Phytophthora faberi*) [*P. palmivora* : *R.A.M.*, viii, p. 26] in the Gold Coast, some 200 lightly wounded pods were inoculated with the fungus. Half of these were dissected at intervals after inoculation and the remainder left for dissection in the coming season on the resumption of activity by the fungus.

It was found that invasion of the peduncle, as far as its insertion on the 'spur', occurs at a very early stage. The fungus spreads both in the cortex and in the medullary rays of the dissected stele. The vascular segments of the xylem do not appear to be invaded, though they are deeply discoloured in the diseased areas. The check to the progress of the fungus through the cortex on its arrival at the spur may be due to the perennial nature of the latter. In the vascular strand the organism proceeds unchecked, still by way of the medullary rays. Later the cortex of the spur and cushion are usually attacked, the entire cortex of the cushion sometimes being involved. Occasionally infection spreads to the bark of the main axis, where an active canker is formed, but in practically all the cases examined, where only the spur and cushion were attacked, the cankered portions dried up about two months after inoculation and were cut off from the crest of the cushion tissues by a cork cambium. The dried masses of dead tissue were detached from the live bark, from which they eventually fell away. Ultimate recovery of the diseased bark is usual, though the attack extends over at least two seasons. During active infection a succession of cork meristems are formed, and these are the origin of the fine red lines constituting a visible network in the freshly cut diseased tissue. At the end of general invasion, normally covering only a few square inches of the bark, a cork cambium is formed which successfully isolates the diseased portion of the bark, causing it to become detached from the healthy tissues, and regeneration begins.

In the vascular strand the fungus progresses as far as the insertion of the trace on the main stele. Between the spur and the insertion of the trace the general discoloration of the strand thins out more or less into black lines, in longitudinal sections, or spots in transverse sections. The discoloration has been found to be due to the accumulation of gum and tannins in the large vessels and adjacent cells; it may be traced right down into the cambium of the trunk, to a distance of three or four inches below the cushion. No hyphae have yet been found beyond the insertion of the peduncular strand, so that further discoloration may possibly be attributed to a remote toxic effect. Cells on both sides of the cambium are involved, several layers on the phloem side being killed while only two or three on the xylem side are affected. Infection of the medullary rays may extend for a quarter of an inch just below the cushion, the diseased tissue being up to one inch in width.

Dissections of experimental material made after 11th October (three months after inoculation) showed no further advance, the

progress of infection apparently having been temporarily arrested by seasonal physiological changes in the host.

During the growth and maturation of the pod, the canker spreads rapidly into cushions from previous bark infections. After the destruction of the pod, however, the cushion and surrounding bark manifest a certain degree of resistance to attack. These facts would seem to indicate some modification in the physiology of the host tissue related to the nutritional conditions connected with the presence or absence of the growing fruit. Similar changes are probably responsible for the arrested activity of the fungus on its arrival at the cambium and for the renewal of growth in the bark at the beginning of the following season.

The presence of the fungus in the damaged cambial region below the cushion has not yet been demonstrated, but there is strong circumstantial evidence that it occurs in this part, the cells of which exhibit phenomena identical with those of the tissues containing hyphae, i.e., tylose, gum, and tannin formation, increased deposit of calcium oxalate in the phloem and medullary ray cells, and discoloration.

Hewison (H. K.). **Variations in the percentages of Cacao crop lost through pod diseases.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 130–134, 1 graph, 1929.

Further data are given [in tabular and graphic form, accompanied by a brief discussion] on the loss due to pod diseases of Amelonado cacao [chiefly *Phytophthora palmivora*: see preceding abstract] in the Gold Coast. The figures analysed extend over the period from April, 1926 to December, 1928, and were recorded at Kpeve, where the plantations are situated in a sheltered valley on a fairly deep medium clay soil overlaid by a layer of rich humus. The highest percentage of infected pods (79·43) was found among those collected in May, 1926, and the lowest (3·39) in the lot of August, 1927. There is no apparent correlation between these data and any general seasonal features. The numerical extent of infection was found to be no criterion of the amount of damage in terms of useless pods. In July, 1926, and January, 1927, when about 50 per cent. of the pods were diseased, only 9·14 and 16·27 per cent. were sufficiently bad to be rejected. On the other hand, in August, 1927, and March, 1928, when the infected pods only amounted to 3·39 and 11·18 per cent. of the collections, 84·39 and 99·66 per cent., respectively, were useless. The average annual loss of potential crop (derived by adding to the actual dry cacao obtained in any one month the *pro rata* value of the useless pods and then extracting the percentage of the possible crop with the useless pods present) was estimated at 13, 6·51, and 6·86 per cent. in 1926, 1927, and 1928, respectively.

Obeng (J. J.). **The non-toxicity of the secretions of Phytophthora faberi Maubl.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 139–140, 1 diag., 1929.

In black pod disease and cushion canker of cacao (*Phytophthora faberi*) [*P. palmivora*: see preceding abstracts] large areas of

discoloured and necrotic tissue are found in which hyphae cannot be detected. This may be due either to the disappearance of the fungus from the injured tissues through exhaustion of nutritive material or auto-intoxication, or to the toxic action of the fungous secretions on tissues which have not actually been invaded. An experiment was conducted to determine whether the substances secreted by *P. palmivora* are toxic to cacao tissues. Pods were inoculated with the filtrate of the fungus from Dox's fluid medium and dilute cornmeal infusion, a syringe being charged with the filtrate and a needle plunged through the cortex and sclerenchymatous layer into the placental cavity; while withdrawing the needle the inoculum was forced from the syringe and thus brought into contact with the placental mucilaginous tissue, and the vascular and cortical tissues. No discoloration developed in these tissues, and it is therefore concluded that *P. palmivora* does not secrete substances toxic to cacao pods.

Salmon (S. C.) & Throckmorton (R. I.). **Wheat production in Kansas.**—*Kansas Agric. Exper. Stat. Bull.* 248, 84 pp., 35 figs., 6 diags., 4 graphs, 1929.

This bulletin contains (pp. 75–82) a section, contributed by C. O. Johnston, on the diseases of wheat in Kansas, of which bunt [*Tilletia foetens*] is stated to be the most destructive [*R.A.M.*, viii, p. 427]. Loose smut (*Ustilago tritici*) occurs in a particularly severe form on wheat in north-eastern Kansas during certain seasons.

Flag smut [*Urocystis tritici*] seems mainly to affect the Harvest Queen variety of wheat in the counties bordering on the Missouri river.

Black stem rust [*Puccinia graminis*] and orange leaf rust [*P. triticina*] [ibid., viii, p. 427] are both common on wheat in Kansas. The former, however, seldom develops early enough to cause serious damage [ibid., ix, p. 97].

Take-all [*Ophiobolus graminis*: ibid., ix, p. 93] appears to be on the increase in Kansas, especially where wheat is grown continuously on the same land. The disease is most severe in seasons following a cool, moist summer. The most practical control measure is quinquennial crop rotation. There are various types of foot rot resembling take-all, except in the absence of the characteristic glossy, black appearance of the lower internodes. These diseases are wholly or partially soil-borne and amenable to control by crop rotation.

Black chaff [*Bacterium translucens* var. *undulosum*: ibid., viii, p. 706] occurs mainly on lodged or very dense stands of wheat in wet seasons. Crinkle joint, so called because the straw of affected plants often bends or breaks at the joint or node, has been prevalent in Kansas wheat fields of recent years. Fungi have been isolated from the diseased material and are believed to be, at least partially, responsible for the condition.

Scab [*Gibberella saubinetii*], basal glume rot [*Septoria nodorum*], mildew [*Erysiphe graminis*], and *Septoria* leaf spot

[*S. tritici*] are usually of minor importance under Kansas conditions.

Durrell (L. W.). **Smuts of Colorado grains.**—*Colorado Agric. Exper. Stat. Bull.* 334, 24 pp., 10 figs., 4 diags., 1928. [Received 1929.]

Popular notes are given on the symptoms, mode of infection, and control of the following smuts affecting Colorado cereal crops: wheat bunt (*Tilletia levis*) [*T. foetens*], oat smuts (*Ustilago avenae* and *U. levis* [*U. kolleri*]), covered smut of barley (*U. hordei*), millet [*Setaria italica*] smut (*U. crameri*) [*R.A.M.*, vii, p. 238], sorghum smut (*Sphacelotheca sorghi*), loose smuts of wheat and barley (*U. tritici* and *U. nuda*), and maize smut (*U. zeae*).

Lungren (E. A.) & Durrell (L. W.). **Seed treatments for stinking smut of Wheat.**—*Colorado Agric. Exper. Stat. Bull.* 333, 12 pp., 1 fig., 1928. [Received 1929.]

The results of three years' experiments in Colorado on the relative efficacy against wheat bunt [*Tilletia foetens*] of seven dry and seven liquid seed disinfectants are described and tabulated.

The best results among the dry treatments were given by copper carbonate, coppercarb, and Bayer compound [*R.A.M.*, viii, p. 229], applied at the rate of 4 or 6 oz. per bushel (the former being sufficient for all practical purposes). Bayer dust and trockenbeize were moderately satisfactory, while copper stearate and Du Pont 37 failed to give adequate control. All the liquid treatments, viz., formalin (1 in 40), copper sulphate (3 lb. per 50 galls.), germisan, chlorophol, uspulun, seed-o-san, and semesan, gave very good control, but the two first-named materially reduced germination and seed-o-san was also somewhat injurious in this respect.

It was found that the bunt spores germinate best at a soil moisture content of 15 to 20 per cent. and a temperature of 55° F. [ibid., vii, pp. 86, 774, *et passim*]. Late plantings, e.g., in October, when the average soil temperature is 48·3°, are more liable to infection than those made in August and September, when the soil temperatures (69·3° and 61·1°, respectively) are too high for spore germination. Spring wheat planted four years in succession in diseased soil showed no infection from this source, and it is therefore considered improbable that the fungus survives the winter in Colorado soils under ordinary conditions.

Simon. **Germisan-Kurz-Beizverfahren.** [Germisan short disinfection process.]—*Illus. Landw. Zeit.*, xlix, 40, p. 462, 1929.

Brief notes are given on the technical and economic aspects of the germisan short disinfection process [*R.A.M.*, ix, p. 100] for the treatment of cereal seed-grain. The results obtained with this method in the writer's recent experiments were superior to those given by dusting in the control of wheat bunt [*Tilletia caries* and *T. foetens*] and *Fusarium* of rye [*Calonectria graminicola*]. The Puk apparatus [ibid., viii, p. 95] was found to be very well adapted to this mode of treatment.

Wormbs (A.). **Trocken- oder Nassbeize; zwei Versuche mit künstlicher Beregnung.** [Dry or liquid disinfection; two experiments with artificial watering.]—*Nachricht. über Schädlingsbekämpf.*, iv, 3, pp. 91–96, 3 figs., 1929.

Particulars are given of the writer's comparative experiments in the control of bunt [*Tilletia caries* and *T. foetens*] and *Fusarium* on General v. Stocken wheat by dry and liquid disinfectants. In the former case the dusts were represented by tillantin and tillantin R, and the liquid preparations by uspulun and copper sulphate. The dusts and uspulun gave equally satisfactory results, while copper sulphate proved ineffectual. In the latter case only tillantin R and uspulun were used, and here again the dust was quite equal to the liquid preparation in efficacy. There was no evidence that watering considerably in excess of the normal rainfall impaired the fungicidal action of the dusts.

Volk (A.). **Trockenbeizwirkung in Abhängigkeit von Bodenreaktion und Bodenart.** [The action of dusts in relation to soil reaction and soil type.]—*Landw. Jahrb.*, lxx, 4, pp. 583–592, 1929.

The results are described and tabulated of recent experiments at Bonn-Poppelsdorf on the effects of soil reaction and soil types on the action of various fungicidal dusts used primarily in the control of wheat bunt [*Tilletia caries* and *T. foetens*].

Acid soil solutions (P_H 4·5) were found to promote the activity of the semi-insoluble copper compounds, such as copper carbonate and the copper component of tillantin, whereas the arsenic component of the latter preparation was not affected by the soil reaction. No effect was produced on the fungicidal activity of tillantin and abavit B by the use of physiologically acid and alkaline fertilizers in far larger quantities than those ordinarily given in practice. The fluctuations in the action of the dusts on different types of soil were no greater than those commonly observed in the case of liquid preparations.

The writer considers that tillantin and abavit B are fully equal to the standard liquid fungicides as regards uniformity of action even under widely divergent environmental conditions.

Stringfield (G. H.). **Inoculating Wheat with loose smut.**—*Journ. Amer. Soc. Agron.*, xxi, 9, pp. 937–938, 1929.

A simple and effective method of inoculating wheat with loose smut (*Ustilago tritici*) has been devised at the Ohio Agricultural Experiment Station. A sufficient quantity of spore material to produce a thick cloud on shaking is placed in a distended paper bag, which is inverted over one or more wheat heads, the mouth being held closed round the culms. The treated heads are then covered with wetted glassine bags, which may be removed some time before maturity. The heads may be treated before the opening of the first flowers, after blooming, or at any time between these two stages. Clipping the tips of the glumes and trimming the awns on bearded varieties have been found to facilitate the process of infection. The average percentage of smutted ears pro-

duced by this mode of inoculation in a test comprising 19 rows was $39{\cdot}8 \pm 2{\cdot}64$.

TAPKE (V. F.). **Influence of varietal resistance, sap acidity, and certain environmental factors on the occurrence of loose smut in Wheat.**—*Journ. Agric. Res.*, xxxix, 5, pp. 313–339, 3 figs., 1 map, 1929.

The main scope of the investigation reported in some detail in this paper was the study of the factors involved in varietal resistance of wheat to loose smut (*Ustilago tritici*). Observations made on anthesis in the susceptible Dawson (C.I. 6161) and the resistant Forward (C.I. 6691) varieties indicated that neither the extent nor the duration of the opening of the glumes has any bearing on relative resistance, since both characters are practically the same in the two varieties. Furthermore, experiments in which the flowers of resistant and susceptible varieties were artificially inoculated with loose smut spores, showed that resistance was not due to escape from infection, since the varieties tested, although grown and inoculated under similar conditions, consistently exhibited wide differences in the percentages of smutted heads. There was evidence, however, that the date of flowering of a variety in a given locality may enable it to escape infection, provided the variety itself is free from smut. In most tests inoculation of the flowers while the pollen was still immature gave higher percentages of infection than when the pollen was ripe, but several highly resistant varieties retained this character even when they were inoculated while the pollen was immature.

The varietal resistance and susceptibility studies covered 102 named varieties and 132 different lots (mostly pure line selections of United States eastern wheats) which were tested during one to three years by hand inoculation of the flowers. The results [which are given in tabular form] showed that Pentad (C.I. 3322), the only durum wheat tested, retained its high resistance throughout the experiments. All the three club wheats included in the test were strikingly susceptible, a percentage of smutted plants and ears as high as 97 being obtained in two of them. It is pointed out, however, that in the Pacific Coast States, where club wheats are extensively cultivated, loose smut occurs but rarely, probably because the low atmospheric humidity which usually prevails in that region during the flowering period of wheat prevents infection. The common wheats tested exhibited a range of relative resistance from almost complete susceptibility to apparent immunity. A list is given of 13 varieties which proved highly resistant or immune under the conditions of the experiment, and which are distributed in all the four commercial groups, with the exception of white wheats, all of which were susceptible. The varieties Fulcaster, Gipsy, Harvest Queen, and Red May comprised both susceptible and resistant strains, while the pure line selections of Hussar (Red Hussar C.I. 4843) and Ridit (Smutproof C.I. 6703) were either highly resistant to or immune from loose smut as well as from bunt [*Tilletia caries* and *T. foetens*].

The experiments further gave some evidence of the existence of physiologic forms in *U. tritici*. No correlation was found between

the hydrogen-ion or titratable-acid values of the juice of wheat plants and their resistance or susceptibility to the smut. Plants grown from infected seed at Rosslyn, Virginia, and Ithaca, New York, were killed to a greater extent during the winter than plants raised from healthy seed. Differences in vegetative vigour induced by cultural measures had little influence on the susceptibility of wheat plants raised from infected seed.

Christensen (J. J.), Stakman (E. C.), & Immer (F. R.). **Susceptibility of Wheat varieties and hybrids to Fusarial head blight in Minnesota.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 59, 24 pp., 2 diags., 1929.

An account is given of experiments conducted at two localities in Minnesota during a period of nine years, more than 350 spring varieties, selections, and hybrids of wheat being tested for relative susceptibility to the head and seed blight caused by different species of *Fusarium* [cf. *R.A.M.*, viii, p. 496].

The results [which are tabulated and discussed] showed that all the strains tested became infected; the common wheats as a whole were more resistant than the durum wheats, though some of the former were very susceptible. The latter also showed considerable variation in resistance to scab.

In 1927, the percentage of blighted heads in the common wheats ranged from 1 to 78, and in 1928 from 6 to 93. The Chul, Bunyips, Emerald, Federation, Gypsum, and Propo varieties were among the most susceptible; Marquis, the most popular variety in the hard red spring wheat section, and Marquillo, a promising rust-resistant variety, were also susceptible. Converse, Glyndon Fife, Haynes Bluestem, Huston, Jumbuck, Ladoga, Norka, Rysting, Wellman, and White Fife were very resistant. The average percentage of infected heads of Glyndon Fife during seven seasons was 4, as compared with 26·7 in Kitchener, 22·1 in Marquis, and 17·4 in Kota.

In 1927, the percentage of infection on different varieties of durum wheats ranged from 1 to 100; Adjini, Negro, Potia Nadiad, and Souri were among the most susceptible, while Batum, Medeah, and C.I. 3198 were resistant. Mindum, Minn. 470 was, apparently, the most resistant of the durum wheats commonly grown in Minnesota and the Dakotas, the average percentage of infected heads in this variety for seven years being 25, as compared with 40·1 in Monad and 36·3 in Acme. There were differences also in the susceptibility of strains within a variety.

A study of the behaviour of crosses between susceptible and resistant parents showed that most of the hybrids from Marquis × Preston and Marquis × Haynes Bluestem were intermediate in their reaction to scab. Some of the lines were as resistant as the resistant parent. In Kota × Marquis all the lines studied were susceptible.

In no class of wheat were any morphological characters observed that could be correlated with resistance or susceptibility, nor was any correlation apparent between reaction to head blight and pubescence or the presence or absence of awns. Some of the susceptible lines from Marquis × Haynes Bluestem resembled the

susceptible, and others the resistant, parent in morphology; this was also true of selections from Marquis × Preston.

No statistically significant differences could be detected between correlation coefficients obtained from heads infected and seeds blighted in the same varieties and lines grown in different years, or in two different series grown in the same year. As the correlations between the percentages of heads or seed blighted in the same varieties ranged from $+0{\cdot}86 \pm 0{\cdot}01$ to $+0{\cdot}92 \pm 0{\cdot}01$ it is concluded that, for practical purposes, data on head infection may be used to replace notes on seed infection in Minnesota.

From the very low, statistically insignificant, correlation coefficients obtained between the percentages of infection in varieties grown in the same year but sown on different dates, or grown at the same place in different years, or at different places in the same year, it was evident that several variables strongly influenced the percentages of infection. These variables consisted, probably, in differences in the meteorological conditions and in the prevalence of different species and physiologic forms of the pathogens.

Dickson (J. G.) & Mains (E. B.). **Scab of Wheat and Barley and its control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1599, 18 pp., 15 figs., 1 map, 1929.

This is a popular account of the symptoms, distribution in the United States, life-history, and control of scab (*Gibberella saubinetii*) of wheat, barley, rye, oats, and maize [*R.A.M.*, ix, pp. 93, 101]. The losses from this disease, which may be extremely heavy during humid seasons, may be reduced by the use of resistant cereal varieties, e. g., Red Rock and Minturki winter wheats, Norka, Progress, Resaca, and selections from Illinois No. 1 spring wheats, and Oderbrucker or other Manchurian types of barley. Clean cultivation is essential, and seed treatment with a standard mercury dust has also given encouraging results.

Greese. **Zur Fusskrankheit des Weizens.** [On the foot rot of Wheat.]—*Illus. Landw. Zeit.*, xlix, 50, p. 586, 1929.

The writer's observations on foot rot of wheat (*Ophiobolus herpotrichus*) in Pomerania have shown that the disease is specially prevalent following barley on light soils [*R.A.M.*, viii, p. 437]. During the past year infection was most severe on early maturing varieties, which were sometimes attacked to the extent of 50 per cent. and above. Light soils are unsuitable for wheat cultivation, but if they must be used for this purpose the crop should be well supplied with potash and phosphoric acid in addition to nitrogen.

Rosella (E.). **Sur deux cas de septoriose au Maroc.** [On two cases of septoriosis in Morocco.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 6–7, pp. 211–213, 5 figs., 1929.

In the spring of 1928 the author received from Rabat, Morocco, wheat plants severely attacked by *Puccinia glumarum* and *P. graminis*, the spikelets of which were violet and bore numerous

pycnidia of *Septoria graminum* or, more often, of *S. nodorum* [*R.A.M.*, viii, p. 638]. Infection was localized at the extremity of the floral organs, and in the awned varieties, which were those most commonly affected, the awns were covered with the pycnidia of the last-named fungus.

In the following spring further attacks of *S. nodorum* took place on wheat in the same locality. A plant examined showed one stool with a violet ear infected by the fungus and two others withered and attacked by insects. When the glumes were cut, a colourless mycelium was found to be localized in the cuticle and epidermal cells. The violet glumes were affected chiefly at the extremities, where in many cases the pycnidia were present; the spores measured 22 to 25 by 3·3 to 5 μ. Cultures of pieces of the glumes and rachids gave pycnidia the dimensions of which approximated closely to those found in nature.

In the author's opinion *S. nodorum* is a weak parasite, the infections described being secondary to the rust or to insect attack.

LINDER (O.). **Die Bekämpfung der Streifenkrankheit bei Gerste, eine wirtschaftliche Notwendigkeit.** [The control of stripe disease of Barley, an economic necessity.]—*Nachricht. über Schädlingsbekämpf.*, iv, 3, pp. 96–100, 2 figs., 1929.

Attention is drawn to the heavy losses (up to 39 per cent.) incurred in 1929 by farmers of the Upper Palatinate (Bavaria) who neglected the disinfection of their barley seed-grain against stripe disease [*Helminthosporium gramineum*]. On the other hand, where treatment with tillantin dust was carried out the crops were perfectly healthy [*R.A.M.*, viii, p. 559]. This method of disinfection costs Pf. 70 per cwt. and there are now 33 Lothrä apparatus available for co-operative use in the Neumarkt district. It is estimated that a farmer who left 4 cwt. of seed-grain untreated in order to save M. 2·80 sustained an ultimate loss of between M. 88 and 132.

STEINER (H.). **Wirkt Düngung als Brandbekämpfungsmittel?** [Does fertilizing control smut?]—*Wiener Landw. Zeit.*, lxxix, 40, pp. 386–387, 1929.

In order to test the validity of Kosterz's assumption that ammonium sulphate, applied as a fertilizer, exercises a fungicidal effect on the spores of loose smut of oats (*Ustilago avenae*) [*R.A.M.*, viii, p. 560], the writer carried out a series of experiments to determine the efficacy of 0·5, 1, 5, 10, and 20 per cent. solutions of this compound on cultures of *Penicillium glaucum*, *Aspergillus niger*, and *Rhizopus nigricans*, all of which are commonly found adhering to the seed-grain. None of the organisms was adversely affected by the ammonium sulphate, whereas a 0·25 per cent. solution of uspulun destroyed them [ibid., viii, p. 558]. A certain reduction of infection (from 18 to 8 per cent.) was observed in a plot of oats treated with ammonium sulphate and, no doubt, can be explained by the shortening of the susceptible period of the seedlings brought about by rapidly acting fertilizers, but the best

results were given by seed-grain disinfection with uspulun (only 0·35 per cent. infection).

Mellanby (E.), Surie (Ella), & Harrison (D. C.). **Vitamin D in ergot of Rye.**—*Biochem. Journ.*, xxiii, 14, pp. 710–717, 1 pl., 1929.

The results [which are described and tabulated] of experiments on puppies showed that ergot of rye (*Claviceps purpurea*) is a powerful stimulus to calcification of bone. The substance responsible for this action is soluble in alcohol and ether, resists saponification, and has the properties, so far as these are known, of vitamin D. The rye germ itself, unaffected by *C. purpurea*, contains a small quantity of calcifying substance which can be extracted by light petroleum. The irradiation of unground ergot grains by strong sunlight produces no increase in calcifying activity, and irradiation by the mercury-vapour lamp only a slight one, notwithstanding the abundance of ergosterol present. Some samples of ergot may be roughly estimated to contain about one-eighth to one-quarter of the calcifying principle of cod-liver oil. All the samples hitherto tested, whether of Russian or Spanish origin, were found to be definitely anti-rachitic.

Starz (E.). **Beizversuche zu Winterroggen im Böhmerwalde.** [Disinfection experiments with winter Rye in the Bohemian forest.]—*Nachricht. über Schädlingsbekämpf.*, iv, 3, pp. 88–90, 1 fig., 1929.

The writer states that the *Fusarium* disease of rye [*Calonectria graminicola*] is very prevalent in the Bohemian forest lands owing to the heavy summer rainfall and the thick snow cover in winter [cf. *R.A.M.*, vii, p. 91]. Excellent control of the disease was obtained in 1926 by immersion of the seed-grain in 0·125 or 0·25 per cent. uspulun-universal for 7½, 15, or 30 minutes, the results with the 0·5 per cent. solution being somewhat less satisfactory but still comparing very favourably with the untreated controls. In 1927 the use of tillantin R dust gave very encouraging results.

Curzi (M.). **Una nuova grave malattia del Granturco.** [A serious new disease of Maize.]—*Rendic. Accad. Lincei*, Ser. 6ª, x, 5–6, pp. 306–308, 1929.

During June, 1929, a new and serious disease of maize appeared in the vicinity of Pavia, where it resulted in the loss of approximately 80 per cent. of the crop. Dark spots developed at the base of the stem and rapidly ringed the circumference, forming a necrosed area on a level with the ground but never spreading to the roots. Affected plants readily fell over but continued to grow and remained green, as the disease did not interrupt the conducting tissues though destroying the parenchyma of the stem.

In the necrosed area the central part of the stem was disorganized and moist, and emitted a putrid smell; the bundles were massed together in the middle or isolated from the ground parenchyma, and were surrounded by the white, sericeous mycelium of an Oomycete with globose, smooth, thin-walled oogonia and one terminal or intercalary antheridium, formed on a separate hypha.

The oospores measured 20 to 25 μ in diameter, had a smooth, rather thick wall, and granular protoplasmic contents with a large, usually excentric, oil drop.

In pure culture the fungus produced an abundant aerial mycelium which grew extremely rapidly, the hyphae extending 2 to 3 mm. per hour at 20° to 25° C. In artificial inoculations on maize development was also very rapid. When pure cultures were grown in an aqueous filtrate of soil numerous oospores were formed, while in distilled or sterile spring water after some days zoospores developed.

The zoosporangia were undifferentiated from ordinary hyphae, and were often simple and uniform, while the zoospores, which were matured in a vesicle at the tip of the sporangial hypha, were biciliate and measured 10 to 14 μ in diameter. The fungus is, accordingly, considered to be a *Pythium* of the *P. gracile* group, but has not yet been identified.

The disease is quite distinct from the root rot of young maize plants caused by *P. arrhenomanes* [*R.A.M.*, viii, p. 168], and is considered to have originated in beets grown the year before in the same field and severely affected by a rot of the taproot. When isolated from maize and inoculated into beets the organism caused a rot which in two days extended over all the upper part of the taproot. That it was soil-borne was indicated by the fact that the plants became affected after being earthed up. As the field was not irrigated, water could not have been an agent in transmission. Probably the fungus was brought in on beet seed from Germany.

Morwood (R. B.). **Cob rot of Maize.**—*Queensland Agric. Journ.*, xxxii, 4, pp. 393–397, 3 pl., 1929.

A brief account is given in popular terms of the cob rot of maize caused in Queensland by *Diplodia zeae* and *Fusarium moniliforme* [*Gibberella moniliformis*], control being recommended by burning all remains of the crop after harvest, rotation, the use of sound seed, and harvesting as soon as the crop is dry. Affected grain should not be used as fodder [cf. *R.A.M.*, vii, p. 166].

Fulton (H. R.) & Bowman (J. J.). **Infection of fruit of Citrus by Pseudomonas citri.**—*Journ. Agric. Res.*, xxxix, 6, pp. 403–426, 5 figs., 1 graph, 1929.

This is a detailed account of experiments on the infection of *Citrus* fruits with the canker organism (*Pseudomonas citri*) [*R.A.M.*, viii, p. 775], which were made in an isolated greenhouse near Washington, D.C. Successful infection was seriously hindered when the oil glands of the fruits were punctured, dependable results being only obtained when the wounds were made between these organs. The largest percentage of infection resulted when the inoculum was applied immediately or less than one hour after puncturing; at the end of eight hours, the wounds were infected much less readily, and no infection developed in older wounds. Drying of the wounds appeared to reduce the period of susceptibility still further.

The results of the experiments indicated that high dilutions of

the inoculum (which was prepared from fresh, vigorously growing *P. citri* cultures, usually on potato plugs) produced lower percentages of infection than more concentrated dilutions, and that the resulting cankers began to show after a longer interval and developed more slowly. With a given concentration of the inoculum, infection was greater in amount and in intensity on wounded leaves than on punctured fruits of a given *Citrus* species. Infection was difficult to obtain on very small fruits. The cankers developed best on fruit 25 to 35 mm. in diameter, but the upper and lower size limits of susceptibility varied with the conditions under which the inoculated fruits were kept.

The largest percentage of infections occurred at visible punctures. Stomatal infections were most abundant on the smaller sizes of growing fruits, and failed to develop at an upper size range some 10 mm. less than that for wound infections.

A quantitative method [which is described] was elaborated for estimating from wound inoculations the number of bacteria present at various stages of the development of canker lesions. Periodical tests indicated that the bacteria multiply in the wounds at about the same rate, independently of the size of the fruits, up to the stage of maturity of the fruit. No definite indication of an increase in the number of bacteria was found in fully ripe fruit which were inoculated after removal from the tree. A maximum number is reached in a few days, after which a rather uniform level is maintained for a considerable time. There was evidence that the organism multiplies in the tissues independently of the appearance of visible lesions on the fruits. No correlation was found between the rate of multiplication of the bacteria and the strength of the inoculum, although a slightly longer period was required to obtain the maximum number with the higher than with the lower dilutions. Observations indicated that the development of *Penicillium* rot had a marked inhibiting effect on *P. citri* in recently developed lesions, a fact which was confirmed in experiments in which mature orange fruits on the tree were inoculated with *P. digitatum* a day after inoculation with *P. citri*.

Evidence was also obtained that *P. citri* may die out on picked fruits within a period of five or six months, though under certain conditions they may persist for even longer. At about 45° F. green inoculated fruits in a moist chamber required a much stronger inoculum and a much longer time to develop approximately the same visible reaction as similar fruit held at a room temperature of about 70° to 75°. The results of the greenhouse experiments were generally confirmed by a small range of inoculation tests under orchard conditions and by experiments in which green fruits were inoculated after removal from the trees and were kept in moist chambers.

Various types and varieties of citrus fruits showed differences in susceptibility to infection. It is pointed out, however, that the significance of this fact in judging relative varietal susceptibility is lessened by the fact that host-tissue reaction may be lacking even when bacterial invasion and development have been at a maximum. The reactive condition of the host tissues is the important factor in canker development.

Control measures for Citrus scab.—*Agric. Gaz. New South Wales*, xl, 10, p. 714, 1929.

Under New South Wales conditions citrus fruits may be effectively protected against scab [*Sporotrichum citri*] by spraying with Bordeaux mixture 6–4–100, plus 1 per cent. red spraying oil, as soon as possible after most of the petals have fallen from the main crop blossom. All diseased mature fruit should be gathered before the main blossoming begins, all fallen fruit should be burned, and badly diseased twigs should be pruned and burned when thinning. When infection is severe, lemons may be given a second application of the mixture and oil in January or February, as soon as possible after most of the petals have fallen. Spraying should not be effected during drought.

Fishlock (W. C.). **Moisture content and mould in copra.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 178–185, 1929.

The most important moulds of copra [the dried endosperm of coco-nut], namely, *Aspergillus niger* and *A. flavus* [see above, p. 163], have been found to grow only on insufficiently dried material in the Gold Coast. A greyish-green superficial mould found after periods of 36 to 61 days on well-dried copra stored in bags on the plantation is evidently distinct from the above-mentioned species. The results [which are tabulated] of investigations on the incidence of mould in copra from 24 lots of kernels stored in bags indicated that it is merely a question of time before all the material becomes infected. Experiments [which are fully described] in the prevention of infection by treating the kernels with sulphur dioxide ($\frac{1}{2}$ lb. burnt in a box of 4 cu. ft. capacity) for varying periods up to 36 hours gave promising results.

Staner (P.). **Les maladies du Caféier dans l'Ituri et le Kivu. Rapport phytopathologique.** [The diseases of Coffee in Ituri and Kivu. Phytopathological report.]—*Bull. Agric. Congo Belge*, xx, 1, pp. 129–140, 1929.

Notes are given on some diseases of *Coffea arabica* observed during a tour of inspection of the Ituri and Kivu districts of the Belgian Congo. *Diplodia* [*Botryodiplodia*] *theobromae* was found on one plant, and two isolated instances were noted of foot rot caused by *Fomes lignosus*, the roots of the dead plants bearing the yellowish-white threads typical of this fungus. Leaf infections included *Cercospora coffeicola*, *Colletotrichum coffeanum* [*Glomerella cingulata*], *Hemileia vastatrix*, and *Phyllosticta coffeicola*, the last-named forming large, irregular, pale-brown spots covered with innumerable black pycnidia, often situated at the leaf tip. At Kisenyi, where this disease was very prevalent, the plants were in bad condition from weeds. In general *C. arabica* is not much affected by disease in this locality.

Staner (P.). **Le die-back du Caféier Arabica.** [Die-back of Arabica Coffee.]—*Agric. et Élevage au Congo Belge*, iii, 21, pp. 325–326, 1929.

In comparing and contrasting the die-back of coffee found in the

eastern regions of the Belgian Congo with the top die-back known in Sumatra [*R.A.M.*, viii, p. 238] the author states that the disease in the former locality is definitely physiological and results from overbearing, precocity, or unsuitable cultural conditions. No pathogen has been found to be associated with the die-back, though after the death of the bushes *Colletotrichum coffeanum* [*Glomerella cingulata*] is often present saprophytically. The first apparent symptom is a characteristic withering of the branches of the median part of the bush, the crown and base usually remaining normal. Sections of diseased branches show blackish-brown rings in the wood, cambium, and bark but no mycelium and no products of defence, such as gum or tyloses. Control is recommended by preventing overbearing by the system now practised in Kenya, known as 'Agobiada'. The young plants, when 15 to 18 in. high, are bent over and kept in this position by a fork until the main stem shows numerous suckers, three of the most vigorous of which, as far apart as possible, are retained, the others being cut away. When the selected suckers are 12 in. high, the fork is removed and the mother stem cut down when it has ceased to produce new growth.

Owing to the vigilance and care of the planters the damage caused by die-back at Ituri and Kivu is not extensive.

WALKER (M. N.). **Soil temperature studies with Cotton. III. Relation of soil temperature and soil moisture to the sore shin disease of Cotton.**—*Florida Agric. Exper. Stat. Tech. Bull.* 197, pp. 345–371, 2 figs., 1 diag., 5 graphs, 1928. [Received January, 1930.]

Under favourable weather conditions the sore shin or *Rhizoctonia* disease of cotton (*Corticium vagum*) [*C. solani*: *R.A.M.*, viii, p. 566] may cause heavy damage in Florida, reducing germination, killing seedlings, and thereby necessitating wholesale replanting.

A series of controlled experiments [the technique of which is described and the results discussed and tabulated] was conducted to determine the relation between soil temperature and moisture and the incidence of infection. The optimum soil temperature range for the death of cotton seedlings (Lightning Express and Express 432) was found to be from 17° to 23° C., with a maximum at 34°. The seeds failed to germinate below 15° and therefore no minimum temperature for killing could be determined. The incidence of infection was found to vary on account of fluctuations in the rate of germination of different lots and varieties of cotton seed.

C. solani made the best growth in culture (potato dextrose agar) between 27° and 29°, the maximum temperature for development being 38° and the minimum 7° to 11°.

Practically 100 per cent. injury occurred on the cotton seedlings in pots inoculated with *C. solani* at all the soil moistures tested, ranging from 2 per cent. to saturation at 20 per cent. of the dry weight of the soil. It is evident, therefore, that any soil moisture at which cotton plants will grow is sufficient for infection by *C. solani*, given favourable soil temperature conditions.

The results of experiments conducted to determine the patho-

genicity towards cotton seedlings of two strains of *C. solani* from cotton and one each from cabbage and potato are briefly described. The cabbage strain, the optimum temperature of which was 24° [ibid., iv, p. 519], was found to be practically innocuous to cotton, only one plant out of 102 being killed, whereas that from potato was almost as virulent as the cotton strains. The optimum temperature for the potato strain was 27°. Work with five other strains of *C. solani* is in progress.

CAMP (A. F.). **Cotton investigations.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1928*, pp. 38 R–41 R, 1928. [Received January, 1930.]

The species of *Fusarium* causing boll rot of cotton in Florida was found to be responsible also for a serious damping-off of cotton seedlings, as well as for the root rot of older plants reported from Georgia [*R.A.M.*, viii, p. 427]. A large proportion of seedlings collected in the field during the current year showed the presence of *F. moniliforme* [*Gibberella moniliformis*], which proved definitely pathogenic in laboratory inoculation experiments.

NEAL (D. C.). **The occurrence of viable Cotton root rot sclerotia in nature.**—*Science*, N.S., lxx, 1817, pp. 409–410, 1929.

Typical sclerotia of the cotton root rot fungus (*Phymatotrichum omnivorum*) have been found at depths of 12, 16, and 32 inches in naturally infested fields in Texas [*R.A.M.*, viii, p. 641]. Cultures from these organs on cornmeal agar produced the characteristic yellow to light ochraceous buff, *Rhizoctonia*-like mycelium of *P. omnivorum*, with bi- and trifurcate branches arising from the large cells. Transfers of this mycelium on alternating layers of sterile soil and cotton roots yielded true sclerotia. The sclerotia produced in culture on 3rd January, 1929, were still viable in the following July after 7 months in the incubator. *P. omnivorum*, therefore, is not restricted to the living roots of susceptible hosts but possesses an independent means of overwintering and dissemination in the form of sclerotia [ibid., ix, p. 108].

DOCTERS VAN LEEUWEN (W. M.). **Ueber eine Galle auf Symplocos fasciculata Zoll., verursacht durch eine Gallmücke: Asphondylia bursaria Felt, die mit einem Fungus zusammen lebt. (Vorläufige Mitteilung.)** [On a gall on *Symplocos fasciculata* Zoll., caused by a gall midge, *Asphondylia bursaria* Felt, living in symbiosis with a fungus. (Preliminary note).] —*Marcellia*, xxv, 1–6, pp. 61–66, 2 figs., 1929.

Young trees of *Symplocos fasciculata* in Java frequently bear, on the stems, petioles, and midribs of the leaves, irregular swellings caused by the gall midge, *Asphondylia bursaria*. Part of the oval larval chamber is situated in the ruptured woody cylinder and part in the cortex. It is surrounded by parenchyma containing an abundance of vascular bundles. The galls reach maturity in December, when the larval chamber, except for a small cavity occupied by the larva, is completely filled by the externally black and internally white mycelium of a fungus. Within a few weeks

the mycelium, with the exception of the outer black shell, is entirely consumed by the growing larva.

Oviposition takes place in the central cylinder, between the pith and cortex, after the emergence of the insects in February and March. Each egg was constantly observed to be accompanied by 1 to 4 spores, the origin of which is uncertain since they were never detected in the intestinal tract of fertile females. These spores germinate at the end of several weeks (by which time the gall tissues are already differentiated), and form a profusely branched, densely woven mycelium, which rapidly fills the entire larval chamber except for the small portion occupied by the larva. The peripheral hyphae assume a black discoloration in December. All attempts to obtain pure cultures of the fungus gave negative results.

This type of symbiosis differs from the well-known ambrosia galls [*R.A.M.*, vii, p. 511], in which the hyphae occupy the interior of the gall and do not penetrate the plant tissues.

Cummins (W. T.), Smith (J. K.), & Halliday (C. H.). **Coccidioidal granuloma. An epidemiological survey, with a report of twenty-four additional cases.**—*Journ. Amer. Med. Assoc.*, xciii, 14, pp. 1046–1049, 1929.

The subject of coccidioidal disease is stated to merit serious consideration because of the high mortality, the unknown method of transmission, and the close clinical and pathological resemblance to tuberculosis. In just over 80 per cent. of the 182 cases tabulated in this paper infection was acquired in California, but the disease occurs also in the eastern and mid-western States, and in South America. *Coccidioides immitis* [*R.A.M.*, viii, p. 574 and next abstract] was isolated from two of the 24 cases here reported for the first time, and the writers believe that the culture of larger quantities of blood on a greater variety of media would elicit a higher percentage of positive results (hitherto obtained only in six cases altogether). The tabulated mortality of 68 per cent. is believed to be probably lower than the actual figure, since the subsequent history of 13 cases is unknown. The disease is prevalent among outdoor workers, suggesting that the fungus may occur in the soil and enter the body through the cutaneous tissues or respiratory tract.

Pulford (D. S.) & Larson (E. E.). **Coccidioidal granuloma. Report of a case treated by intravenous dye, colloidal lead and colloidal copper, with autopsy observations.**—*Journ. Amer. Med. Assoc.*, xciii, 14, pp. 1049–1056, 13 figs., 1929.

Full clinical details are given of a fatal case of coccidioidal granuloma, caused by *Coccidioides immitis* [see preceding abstract], in a forty-year-old wholesale produce dealer of Woodland, Sacramento Valley, California. Death occurred 16 months after the primary infection, which seemed to be of pulmonary origin and of a rather virulent type. A temporary beneficial effect was exerted by gentian violet and X-ray treatments, while injections of colloidal lead, colloidal copper, and vaccine gave negative results. The causal organism was isolated from the tubercular granulation

tissue of an excised rib, and a post-mortem examination revealed a widespread predominantly bony distribution of infection. The constantly increasing number of reported cases of coccidioidal granuloma indicates either that the disease is spreading or becoming better recognized by the medical profession. The use of the misleading term 'California disease' should be discontinued. Attention is drawn to the similarity in various respects between coccidioidal granuloma, tuberculosis, and blastomycosis, but definite evidence has been obtained of the specificity of *C. immitis* in the causation of the first-named condition. Successful inoculation experiments have been carried out on guinea-pigs through the intravenous, subcutaneous, or intraperitoneal routes.

Sutejew (G.), Utenkow (M.), & Zeitlin (A.). **Beitrag zur Ätiologie, Röntgendiagnose und Röntgentherapie der Blastomykose.** [Contribution to the etiology, Röntgen diagnosis, and Röntgen therapy of blastomycosis]—*Fortschr. auf dem Gebiete der Röntgenstrahlen*, xl, 3, pp. 475–483, 11 figs., 1929.

After a discussion on the present status of knowledge regarding blastomycosis (a term which is criticized as old-fashioned, artificial, and misleading), the authors give full clinical details of a case of this disease involving the skin, bones, and lungs of a 26-year-old woman in Moscow. A fungus isolated from the matter of an abscess on the right cheek-bone, and subsequently detected in other affected regions and in the sputum, is named *Monilia interposita* n. sp. [without a diagnosis]. The organism utilized saccharose, maltose, and dextrose in a synthetic culture [the composition of which is indicated] and formed alcohol. It was pathogenic to laboratory animals. The patient was cured by means of X-ray therapy. The writers believed that 'blastomycosis', especially 'moniliomycosis', is more prevalent than is generally assumed and suggest the extended use of X-ray methods in diagnosis and treatment.

Grossi (G.) & Balog (P.). **Clinical and experimental studies on Castellani's pulmonary moniliasis.**—*Journ. Trop. Med. & Hygiene*, xxxii, 18, pp. 253–262, 3 figs., 1929.

An account is given of the writers' observations at Cairo on Castellani's pulmonary moniliasis, associated with the presence in the sputum of affected patients of oval cells measuring 2·5 to 5 μ in diameter, which Redaelli has identified as *Monilia* [*Candida*] *pinoyi* [*R.A.M.*, viii, p. 722]. Inoculation experiments by the writers and others on laboratory animals have given consistently positive results [which are described at some length]. The existence of specific cutaneous allergy in moniliasis patients was demonstrated by intradermal inoculations with an emulsion prepared from living cultures. Vacciniotherapy was carried out by means of hypodermic injections with progressive doses (up to 1 c.c.) of an emulsion heated at 45° C. for one hour, and also with a natural unattenuated vaccine, with very encouraging results in twelve cases. Cultures of *C. pinoyi* were killed by two minutes' exposure to 65 per cent. alcohol, while corrosive sublimate (1 in 1,000) and

4 per cent. formaldehyde required five minutes to produce the same effect. The cultures underwent partial lysis as a result of 15 or 30 minutes' exposure to a Hanau lamp at 50 cm. distance, but inoculation experiments on animals showed that no loss of virulence was incurred through radiation.

WILENCZYK (A.). **Obtention de Trichophyton violaceum et de Trichophyton granulosum, à partir d'éruptions cutanées portées par un même sujet. Pléomorphisme de Trichophyton violaceum.** [Isolation of *Trichophyton violaceum* and of *Trichophyton granulosum* from cutaneous eruptions on the same patient. Pleomorphism of *Trichophyton violaceum*.]—*Comptes rendus Soc. de Biol.*, cii, 26, pp. 109–110, 1929.

From the squamae of the inflamed areas on the head, thorax, and nails of a female patient, the writer isolated a fungus which presented the characteristics of *Trichophyton violaceum* at 37° C. and of *T. granulosum* at 24° alternating with room temperature [*R.A.M.*, viii, p. 576]. This is regarded as a further instance of pleomorphism in the dermatophytes [loc. cit.], a phenomenon which the writer attributes partly to variations in temperature, while an even more important factor is the evaporation of water resulting in an increase in the concentration of the medium.

WILENCZYK (A.). **Étude expérimentale des asques de champignons parasites des cheveux.** [Experimental study of the asci of fungi parasitic on hair.]—*Comptes rendus Soc. de Biol.*, cii, 26, pp. 113–114, 1929.

Asci of *Trichophyton violaceum*, *T. granulosum* [see preceding abstract], and *Achorion schoenleini* sown on a fresh medium at 37° C. produce cultures having the normal characters of each species. At room temperature, however, the asci of each species produce almost black cultures composed of mycelium and asci borne on aerial hyphae; these asci develop ascospores which in turn yield a new mycelium. The asci of *T. violaceum*, kept at room temperature for 48 hours, then transferred to 37°, developed a purple mycelium in 10 to 12 days. The asci from the black cultures did not develop at 37°.

NEGRONI (P.). **Un nouveau Trichophyton endothrix, Trichophyton areolatum n. sp.** [A new *Trichophyton* endothrix, *T. areolatum* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, vii, 5, pp. 438–443, 7 figs., 1929.

A brief morphological and cultural account is given of a species of the endothrix group of *Trichophyton* which was isolated from a ringworm of the scalp in Paris. On Sabouraud's culture medium the organism at first strongly resembles *T. acuminatum* [*R.A.M.*, viii, p. 309], but later the colonies, while remaining acuminate, acquire a purple-red colour and are covered with a very delicate white down. In view of its pleomorphism, of its colour, and of the nature of the colonies which at the end of one month may attain a size up to 4 cm. in diameter and are definitely zonate, the species is considered to be new to science and is named *T. areolatum*. No technical diagnosis of the organism is given.

KARRENBERG (C. L.). **Nagelepidermophytie mit positiver Kultur. (Bemerkungen über die Mykologie der Nagelepidermophytie überhaupt, die normale Flora der Nägel sowie zum mikroskopischen und kulturellen Pilznachweis bei Nagelmykosen).** [Epidermophytosis of the nail with positive culture. (Observations on the mycology of epidermophytosis of the nails in general, the normal flora of the nails, and the microscopic and cultural determination of fungi in epidermophytosis of the nails).]—*Arch. für Dermatol.*, clviii, 2, pp. 431–442, 2 figs., 1929.

Full details are given of the cultivation of *Epidermophyton inguinale* [*R.A.M.*, vii, pp. 635, 636], isolated from a fragment of a nail from a patient with generalized mycosis. This is believed to be only the second record of the organism in question as the cause of onychomycosis, the first being by Brünauer (*Dermatol. Zeitschr.*, xxxv, p. 148, 1922). Instances of the condition associated with other species of *Epidermophyton* are cited from recent literature, and some observations are made on culture technique.

WILLIAMS (C. M.) & BARTHEL (ELSE A.). **Tinea of the toe-nails as a source of reinfection in tinea of the feet.**—*Journ. Amer. Med. Assoc.*, xciii, 12, pp. 907–910, 6 figs., 1929.

In a series of forty cases of tinea pedis [two of which are described] *Trichophyton interdigitale* or a closely related organism was isolated from the toe-nails [*R.A.M.*, viii, p. 781]. So slight was the abnormality of the nails that neither the patients nor their doctors were ordinarily aware of it. A species of *Monilia*, the significance of which is doubtful, was also isolated in immense numbers from clippings of the affected nails. Infection was found to persist in the toe-nails long after the disappearance of all cutaneous symptoms.

KESTEN (BEATRICE) & MARTENSTEIN (H.). **Experimental sporotrichosis. Cutaneous and intracardial inoculation: a preliminary report.**—*Arch. of Dermatology*, xx, 4, pp. 441–444, 1929.

Cutaneous inoculations of *Sporotrichum* spores were found to produce in rats an eruption composed of minute papules. The infection extends to the regional lymph glands. Following the intracardial inoculation of a suspension of *Sporotrichum* spores, a similar papular eruption develops on the skin of rats, especially on previously irritated areas. Generalized sporotrichosis may also be induced by intracardial inoculation. Animals in which cutaneous eruptions had been induced by cutaneous inoculation showed, after subsequent intracardial inoculation, a curtailment of the duration of the blood infection.

LEINATI (F.). **Ulcere micotiche sperimentali dello stomaco.** [Experimental mycotic ulcers of the stomach.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, iv, 3–4, pp. 147–223, 29 figs., 1929.

Full technical and clinical details are given of an extensive

series of inoculation experiments carried out on laboratory animals (chiefly guinea-pigs) with *Sporotrichum beurmanni* and *Mucor racemosus* [*R.A.M.*, viii, pp. 37, 575]. It was found impossible to induce any pathological effects in the animals by mixing the fungi with their food, but when injected into the wall of the stomach both organisms caused the development of acute ulcers, which healed in a month or less notwithstanding the presence in the granular tissue of numerous fungal elements in an active state. The development of chronic ulcers appears to be due less to the direct action of the fungi than to modifications in the mucus associated with mechanical and chemical factors connected with the infection.

EMMEL (M. W.). **Aspergillus fumigatus infection of the kidney.** —*Journ. Amer. Veter. Med. Assoc.*, lxxv, 3, p. 369, 1929.

An unusual case of kidney disease of fungus origin in an eight-weeks-old chicken is very briefly reported. The anterior two-thirds of the right kidney was found to be covered with a very adherent greenish-brown growth of *Aspergillus fumigatus* [*R.A.M.*, ix, p. 35], the hyphae of which had penetrated the capsule and entered the adjacent parenchyma of the kidney. The occurrence of this fungus in natural infections of the visceral organs is stated to be very rare, though internal necroses have been induced by intravenous or intraperitoneal inoculation.

CURZI (M.). **Intorno alla posizione sistematica di un Fusarium isolato dalla pelle del cane.** [On the systematic position of a *Fusarium* isolated from the skin of a dog.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. IV, 1, pp. 95–105, 2 figs., 1929.

A morphological study of a *Fusarium* isolated from a cutaneous lesion in a dog suffering from vesicular dermatitis showed the presence only of the macroconidial stage. The sickle-shaped, dorsi-ventral, usually 5- but often 3- to 7- septate conidia, with a tapering apex and an easily distinguishable foot cell, measured 34 to 60 by 3·7 to 4·5 μ, and were formed on the mycelium either sparsely or as thick coraline or pale orange sporodochia, or moist, muddy pseudopionnotes. Smooth or very rugose, tawny-ferruginous chlamydospores were constantly present, either singly, in short chains, or grouped in variously shaped clusters. In media rich in carbohydrates single, globose, cream-coloured, later fuliginous sclerotia developed, 0·5 to 2 mm. in diameter, having a hyaline, plectenchymatous inner structure.

In view of these characters the author refers the organism to the *Gibbosum* section of *Fusarium* [cf. *R.A.M.*, iv, p. 707]; owing to the pale stroma, abundant aerial mycelium, which was red in the light, and other characters of less importance, it is placed in the subsection *Ferruginosum*, and as it is considered to differ from the other species of this subsection is named *F. moronei* n. sp. [ibid., viii, p. 37], a Latin diagnosis being given.

Notes are appended on some of the other species of *Fusarium* found on animals, and there is a bibliography of 23 titles.

Cummins (H. A.), Kennelly (Violet C. E.), & Grimes (M.). **A study of fungi found in milk.**—*Scient. Proc. Roy. Dublin Soc.*, xix (N.S.), 20–28, pp. 311–319, 2 pl., 1929.

In this paper the cultural characters are given of the species of fungi which were found in 1929 in samples of milk examined in the Department of Dairy Bacteriology, University College, Cork, namely, *Oidium* (*Oospora*) *lactis*, *Acrostalagmus cinnabarinus*, *Sporotrichum carnis*, *Trichothecium roseum*, *Stysanus microsporus*, *Mucor racemosus*, *M. corymbifer*, *M. mucedo*, *M. alternans*, *Thamnidium elegans*, *Pilobolus crystallinus*, *Botrytis cinerea*, *Aspergillus glaucus* group, *A. luteo-niger*, *A. terreus*, *Macrosporium sarcinula*, *Stemphylium botryosum*, and species of *Hormodendrum*, *Penicillium*, *Phoma*, and *Torula*.

It is pointed out that many of these fungi had not been previously recorded from milk.

Laubert (R.). **Zwei wenig bekannte Pflanzenkrankheiten aus meinem Garten.** [Two little known plant diseases from my garden.]—*Blumen und Pflanzenbau*, xliv, 10, pp. 184–185, 2 figs., 1929.

A brief popular account is given of an infection of foxglove (*Digitalis purpurea*) leaves by *Ramularia variabilis*, which produces, chiefly on the lowest leaves, irregularly angular spots, 2 to 7 mm. in width, tobacco-coloured with a reddish border above, and greyish-brown below where there is a more or less distinct, delicate, white coating. In severe cases the lesions fuse and the entire leaf shrivels. The simple conidiophores emerge in tufts through the stomata; the conidia are cylindrical, elliptical, or oval, 6 to 20 by 3 to 4 μ in diameter, hyaline, thin-walled, and often papillate. The fungus also occurs on *Verbascum* spp.

The other disease mentioned is caused by a worm.

Martin (G. H.). **Polymorphism of Leptosphaeria coniothyrium (Fckl.) Sacc.**—*Phytopath.*, xix, 9, p. 879, 1929.

Isolations made from the twigs, stems, leaves, hips, and seeds of roses attacked by *Leptosphaeria coniothyrium* [*R.A.M.*, vii, pp. 99, 446] resulted in the development of a fungus microscopically resembling a yeast. This appears to be the initial phase of *L. coniothyrium*, and has been referred to the genera *Polyspora* and *Kabatiella*. It is regarded as a *Pseudosaccharomyces* by the author, and the subsequent growth of budding cells obtained from it is referred to *Pseudofumago* [ibid., viii, p. 175]. On the stem lesions and leaf spots, as well as in culture, the *Pseudofumago* stage is characterized by the formation of short chains or glomerules composed of globular or ellipsoid, simple or septate cells. Transfers from these two stages in culture yielded a mycelium bearing pycnidia which contained conidia, at first hyaline and resembling those of a *Phyllosticta* or *Phoma*, but later becoming coloured and readily recognizable as those of *Coniothyrium*. The last-named stage also developed on the twigs, stems, hips, and seed from which the *Pseudosaccharomyces* and *Pseudofumago* forms were isolated, when the material was kept for 10 to 18 days under warm, damp conditions. A recent collection from one canker yielded all the

above-mentioned forms, as well as the *Leptosphaeria* perithecia, and monospore cultures from the ascospores produced *Coniothyrium* in culture.

VOGLINO (P.). **L' annerimento o Gloeosporiosi del Ciclamino.** [The blackening or Gloeosporiosis of Cyclamen.]—*La Difesa delle Piante*, vi, 4, pp. 1–3, 1 fig., 1929.

An account is given of a wilt of the leaf and floral shoots of *Cyclamen persicum* observed by the author in the vicinity of Turin, where the disease, apparently identical with that reported by Sibilia from Florence as due to a new species of *Gloeosporium*, which he named *G. cyclaminis* [*R.A.M.*, v, p. 741], occasions heavy losses to growers.

Examination of the affected parts showed the presence of cylindrical, curved, septate, irregularly branched hyphae, 3 to 5 μ in diameter, with acervuli bearing hyaline, then olivaceous, cylindrical-clavate, straight or slightly curved conidiophores, averaging 16 to 20 by 3 μ; the cylindrical or long-elliptical, hyaline conidia averaged 12 by 4 μ.

Notes are given on the cultural characters of the fungus. Inoculations of the young shoots of healthy cyclamens with germinating conidia gave positive results.

Satisfactory control was obtained in a bed where one plant was affected, by removing this and repeatedly spraying the remainder with oxychloride of copper.

MCWHORTER (F. P.). **Basal rot of Narcissus. A report on the effect of cold disinfectant treatments at planting time on basal rot and on yield.**—*Florists' Exchange*, lxxii, 8, pp. 13, 15, 1929.

The results [which are tabulated and discussed] of a recent series of tests in the control of basal rot of narcissus [*Fusarium* sp.: *R.A.M.*, viii, p. 635] by disinfection of the bulbs with various organic mercury compounds showed that a very satisfactory increase of yield and improvement in quality follow 2½ to 3 hours' immersion in 0·25 per cent. semesan. These effects were found to be due, at any rate in part, to the reduction of basal rot, and not merely to the stimulatory action of the compound.

BRIANT (A. K.) & MARTYN (F. B.). **Diseases of cover crops.**—*Trop. Agriculture*, vi, 9, pp. 258–260, 1 pl., 1929.

In this paper notes are given on the incidence in Trinidad of the fungal diseases of cover crops investigated in 1927–8. Sunn hemp (*Crotalaria juncea*) is severely attacked by a wilt which may cause considerable losses, especially when the crop is grown for seed. The causal organism, the pathogenicity of which to this host was proved in inoculation experiments, is morphologically and culturally indistinguishable from *Fusarium vasinfectum*. It does not appear to be capable of attacking pigeon peas or cowpeas. Sunn hemp seedlings, especially when sown thickly, also suffer fairly severely from another disease, the symptoms of which are the formation of brown depressions, 4 to 6 mm. long and 1 to 2 mm. wide, surrounded by a brownish-black margin, on the hypocotyl

and cotyledons. Badly diseased seedlings are often killed, but usually the plants recover. The depressed areas of the hypocotyl and cotyledons, and also the seed-coats before sowing (which were rather shrivelled in appearance), were found to bear acervuli of a species of *Colletotrichum*, which is considered to be new to science, and is named *C. curvatum*. The fungus grew and fructified quite readily on the usual artificial culture media. On one per cent. prune agar the aerial mycelium was greyish-white, and the surface of the medium was spotted with black acervuli, from which long, dark setae were never absent. The spores were hyaline, falcate, acute at each end, white with a faint pinkish tinge in mass, and measured 16 to 22 by 3·6 μ (average 19·8 by 3·6 μ). The setae were brownish-black, septate, tapering towards the tip, and 90 to 160 by 4 to 6 μ in diameter. Inoculation of the seed with a suspension of the spores reproduced the disease, and the organism was re-isolated. Steeping the seed for 10 minutes in a 1:320 solution of formalin did not apparently control the disease. The leaves of sunn hemp were also frequently affected by a zoned leaf-spot due to a species of *Cercospora*, which, however, did very little harm.

Sword bean (*Canavalia ensiformis*) was slightly attacked by *Sclerotium rolfsii* [ibid., ix, p. 19]. Cowpea was extensively affected with mosaic, which was successfully transmitted to healthy plants in the greenhouse by hypodermic needle inoculations of the leaf extract, under insect-free conditions. Experiments indicated that aphids and jassids play no part in the dissemination of the disease in the field crop, where these insects were very abundant. A leaf spot caused by *Cercospora cruenta* was also very common on the older leaves of this host, and the *Oidium* stage of a powdery mildew was observed on cowpea plants in the greenhouse. Pigeon pea was commonly attacked by rust (*Uromyces dolicholi*) and by a stem canker caused by an undetermined sterile mycelium. Bengal bean (*Stizolobium aterrimum*) seedlings were killed in large numbers during the wet season by *Corticium vagum* [*C. solani*]. Mature leaves of this crop frequently bore leaf spots up to $\frac{1}{8}$ in. in diameter, caused by a species of *Cercospora*.

MELCHERS (L. E.). **Alfalfa diseases in Kansas.**—*Twenty-sixth Bienn. Rept. State Board of Agric. Kansas*, xxxi (*1927–1928*), pp. 153–173, 14 figs., 1929.

Popular notes are given on the symptoms, effects, and control of some important diseases of lucerne in Kansas, namely, leaf spot (*Pseudopeziza medicaginis*) [*R.A.M.*, viii, p. 120], leaf blotch (*Pyrenopeziza medicaginis*) [ibid., vii, p. 620], first reported in the State in 1917 and sometimes causing up to 100 per cent. infection; rust (*Uromyces medicaginis*) [*U. striatus*: ibid., iv, p. 122], attacking the leaves and young stems; downy mildew (*Peronospora trifoliorum*) [ibid., viii, p. 294], bacterial blight (*Bacterium medicaginis*) [ibid., vii, p. 619], bacterial wilt (*Aplanobacter insidiosum*) [ibid., viii, p. 313], violet root rot (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*: ibid., viii, p. 527], various types of crown rot, and winter killing [ibid., viii, p. 313].

WEIMER (J. L.). **Additional hosts of Fusarium oxysporum var. medicaginis.**—*Journ. Agric. Res.*, xxxix, 5, pp. 351–353, 1929.

The experiments briefly reported in this paper were conducted in 1927 at West Point, Mississippi, for the purpose of establishing the host range of the lucerne wilt fungus (*Fusarium oxysporum* var. *medicaginis*) recently described by the author [*R.A.M.*, viii, p. 247]. The tests included a number of different plants, among which garden peas, common vetch (*Vicia sativa*), and hairy vetch [*V. villosa*] alone were found to be susceptible to the fungus.

Another series of experiments carried out at Manhattan, Kansas, in an attempt to study the comparative susceptibility of 16 varieties of lucerne under field conditions, gave inconclusive results.

MAYLIN (M.). **La destruction et la chute des fruits dues aux maladies cryptogamiques.** [The destruction and dropping of fruits due to fungous diseases.]—*La Vie Agric. et Rurale*, xviii, 40, pp. 212–216, 1929.

Popular notes are given on some common fungous diseases of fruit occurring in France, together with directions for their control [cf. *R.A.M.*, viii, p. 580].

It is stated that Bleue de Belgique plums at Montauban bore satisfactory crops in 1928 notwithstanding the attacks of silver leaf [*Stereum purpureum*].

Apple mildew (*Oidium*) [*Podosphaera leucotricha*: ibid., viii, pp. 179, 511] is most severe on the red and white winter Calvills, Bismarck, Cellini, and Landsberg and Orleans Pippins, while Beauty of Boskoop and Cox's Pomona appear to be resistant.

Plum rust (*Aecidium punctatum*) [*Puccinia pruni-spinosae*: ibid., viii, p. 451] causes particularly heavy damage on the Ente and Reine-Claude varieties.

Plum, peach, and almond trees are liable to infection of the roots, trunks, and branches by *Polyporus fulvus*, the first-named host being particularly susceptible in the environs of Paris and the other two in Lot-et-Garonne.

In 1928 *Sclerotinia cinerea* destroyed practically the entire sour cherry crop in the south-west of France.

SIEGLER (E. A.). **The woolly-knot type of crown gall.**—*Journ. Agric. Res.*, xxxix, 6, pp. 427–450, 8 figs., 1929.

Details are given of experiments conducted from 1925 to 1928 inclusive, in which seedlings and grafts of a number of apple varieties were inoculated with the organism previously referred to by the author as the apple strain of *Bacterium tumefaciens* [*R.A.M.*, ix, p. 92]. The high percentage of positive results obtained and the fact that controls, especially in the later part of the experiments, remained practically unaltered, are considered to justify the conclusion that this organism is the cause of the woolly knot or hairy root type of crown gall. It is further believed that it is identical with, or at least closely related to, the so-called non-pathogenic strains of *B. tumefaciens* of other workers, since these strains have given similar results, when inoculated on the underground parts of apple shoots. It is quite distinct, however, from

certain other strains which produce the comparatively smooth type of gall with slight or no root development.

It was shown that when apple grafts were inoculated by immersion in a suspension of the apple strain before callus formation, abundant infection occurred, whereas negative results were much more frequent when the grafts were immersed in the inoculum after callus had formed. Some measure of control was obtained when the apple scions and stocks were surface disinfected previous to grafting, this being attributed to the aseptic condition of the grafts at a time when they were most susceptible to infection.

A small range of experiments indicated that the amount of nutrient substance available at the point of inoculation may be a factor of greater importance in the amount and kind of infection secured, than the presence of rapidly growing tissue.

ROSEN (H. R). **The life-history of the fireblight pathogen Bacillus amylovorus, as related to the means of overwintering and dissemination.**—*Arkansas Agric. Exper. Stat. Bull.* 244, 96 pp., 48 figs., 1929.

A very full account is given of the author's investigations into the general pathology of fireblight of apples (*Bacillus amylovorus*) [*R.A.M.*, viii, p. 651] in Arkansas. Amongst the host plants of this organism mentioned [ibid., viii, p. 386], a species of *Amelanchier* cultivated for its edible fruit and an oriental species of *Crataegus* are reported for the first time.

Pear varieties were in general more severely affected than susceptible apple varieties, partly because apples, being a more important commercial crop, are better cared for. Growers are recommended to remove pear trees from the vicinity of apple orchards owing to the amount of infectious material they produce, but the prevalent view in Arkansas that fireblight on apples is due to the overwintering of *B. amylovorus* on blighted pears is not supported by the facts. As pears bloom one to three weeks earlier than most apple varieties, bloom blight, when it appears, does so first on pears, with the result that the conclusion is often erroneously drawn that the organism has overwintered on the latter host. All the evidence showed, however, that it frequently overwinters on apples [ibid., viii, p. 315].

Numerous infections were obtained on very young pear and apple leaves and on floral organs by spraying with a water suspension of the organism. Floral infections were similarly obtained on peduncles, the walls of the receptacles, the calyx lobes, and petals. With the possible exception of the petal infections, those on all the other floral organs, as well as on the leaves, were induced by the bacteria effecting an entrance through the natural openings, especially the stomata.

Cytological and histological studies of pear petal infections showed that the bacteria make their way between the cells in the absence of air passages by dissolving the cell walls and middle lamellae, this intercellular invasion resulting in marked discoloration, plasmolysis, and change in the physical state of the protoplasm. In no case were the bacteria observed within the protoplast. Cell wall materials are considered to serve as a source

of energy for *B. amylovorus*, and water plus dissolved materials are presumably obtained from the protoplasts. The mode of action of the bacteria within the tissues shows that the organism is a strict parasite which attacks the materials present in certain cell walls and rapidly encircles and kills the protoplasts [ibid., viii, p. 250]. In infected pear petioles the cell walls of the cortical tissues undergo swelling and lamellation, indicating the production of cell-wall destroying enzymes which act partly in advance of bacterial invasion. In addition to their presence in the petiolar cortex, the outer layers of which are especially prone to invasion, the bacteria were also present in cavities in the phloem and even in the xylem vessels of infected petioles.

Attention is directed to the fact that while cortical invasions are most common in stem infections of pear and apple by *B. amylovorus*, the most serious invasions result in the destruction of the phloem and cambium, and it is owing to the death of the latter tissues that the parts above an infected region are killed.

It was found that cork formation may take place within the tissues without any outward indication, while cankers possessing well-defined, suberized and cracked margins are fully capable of carrying the parasite throughout the winter: hold-over cankers are indistinguishable outwardly from those in which the bacteria are not viable.

The same cytological effects occur in cortical stem infections as in those of the petiole, with the exception that whereas the latter are localized, the former are frequently diffuse, resulting in an invasion of the inner cortex, phloem, cambium, xylem, and pith. Secondary invasion by other organisms frequently follows *B. amylovorus*. In xylem invasion the vessels are frequently occupied by masses of bacteria, the discoloration of the xylem in an infected region being due mainly to the colour imparted to the vessels and to the accompanying woody fibres. At the one cross-section level of old and young stems there may be great variation in the composition of the masses of material occupying the vessels: in some cases apparently normal masses of *B. amylovorus* are seen, in others the masses consist of disintegrated bacteria, and in others again they consist of a finely granular, gummy material. Similar variation was observed in other stem tissues.

Surface disinfection or scarification of cankers cannot be expected to control the disease, as the causal organism is often so deep-seated.

A bibliography of 51 titles is appended.

Magness (J. R.). **Collar rot of Apple trees.**—*Washington Agric. Exper. Stat. Bull.* 236, 18 pp., 3 figs., 1929.

Collar or crown rot of apple trees is stated to be one of the most serious orchard problems of the irrigated districts of Washington, where winter injury is probably the chief cause of the trouble [*R.A.M.*, viii, p. 385]. The bark of the roots was found to be killed by exposure to a temperature of 23° F. in the middle of November, 1928, while on 8th December a temperature of 17° destroyed it. The absence of callus formation at the edges of collar rot areas indicates that healing is not usual under ordinary

conditions, but digging away the soil from the diseased parts facilitates this process as a result of the drying-out of the dead tissue. Roots uncovered in June withstood temperatures of 0° in December with very little injury, whereas freshly dug roots and those uncovered in October were killed at 17°. The best time to uncover the roots is in the early spring. Callus formation and healing are further promoted by the removal of the fruit from diseased trees. Bridge or nurse grafting may also be of assistance in very severe cases.

Osterwalder (A.). **Die Phytophthora-Krankheit des Kernobstes, eine noch wenig bekannte Obstfäulnis.** [The *Phytophthora* disease of core fruit, an as yet little known fruit rot.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxviii, 18, pp. 329–332, 1 fig., 1929.

Popular notes are given on the decay of pears and apples caused by *Phytophthora omnivora*, which is stated to have been extremely prevalent in Switzerland during the summer of 1929. Infected fruits present a pasty appearance and are covered with brown spots (often showing a bluish tinge), while under moist conditions a white coating, composed of the fructifications of the fungus, develops over the affected area. The organism extends below the epidermis and ultimately destroys the entire fruit. *P. omnivora* overwinters in the fallen fruits which are left to rot on the ground, and the disease may therefore be controlled to some extent by the systematic destruction of all infected material.

Green (F. M.). **Effect of acid wash on the keeping qualities of Apples. A practical home-made Apple-washing machine.**—*Colorado Agric. Exper. Stat. Bull.* 343, 18 pp., 2 figs., 1 diag., 1 graph, 1928. [Received 1929.]

The results [which are discussed and tabulated] of storage tests on Jonathan, Rome Beauty, Winesap, Arkansas, and Ben Davis apples in Colorado indicated that washing in weak concentrations of hydrochloric acid solution (for the removal of spray residue) [*R.A.M.*, viii, pp. 49, 50] does not affect the keeping quality of the fruit when due care is exercised. The use of disinfectants, e.g., formalin, in the solution did not improve the keeping quality. Packing the fruit with a small amount of moisture was not found to increase rotting under favourable storage conditions. Internal breakdown, scald, and shrivelling were not influenced by washing, and, moreover, this process did not affect the taste or appearance of the fruit. Calyx and stem-end discoloration is stated to be largely due to the accumulation of free arsenic at these points while the fruit is on the tree.

The actual cost of washing apples on the College farm during the past season was 2½ cents per packed box. The construction of an efficient machine of the Oregon type, using the flotation system with paddles for propelling and elevating the fruit, is explained, and recommendations made for its use. The approximate cost of such an apparatus is $75 to 100.

CAHILL (V.). **Experiments for the control of exanthema in Japanese Plum trees.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., vi, 3, pp. 388–394, 7 figs., 1929.

Exanthema of citrus trees [*R.A.M.*, viii, pp. 772, 773] is prevalent throughout the orange-growing areas of Western Australia, chiefly on light, gravelly soils over a stiff, impermeable subsoil, though also found on otherwise badly drained land. In the vicinity of the Darling mountains a similar condition affects the Satsuma and Santa Rosa varieties of Japanese plum [? *Prunus salicina*]. Die-back is usually a conspicuous symptom of the disease, which can also be recognized by the presence of hard, rough, irregular fissures in the bark, often more or less covered with a dirty reddish-brown gum.

In the winter of 1924 a number of affected Santa Rosa plum trees were treated by a soil application of crushed copper sulphate crystals at the rate of 2½ lb. per tree; the following season the trees resumed normal growth and this continued for four years. The remaining trees, except twelve, were sprayed with Bordeaux mixture 6–4–40 just before the opening of the flower- and leaf-buds, and again with Bordeaux mixture 4–4–40 in the spring of 1925 and 1926, after the fruit had set; all the treated trees remained healthy, but 50 per cent. of the untreated ones became affected.

HAHN (G. G.). **Preliminary report on a variety of Red Currant resistant to Weymouth Pine rust.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxx, 2, pp. 137–146, 2 pl., 1929.

In 1927 the author's attention was called by I. Jørstad, the Norwegian Government Mycologist, to the resistance of the so-called Red Dutch currant variety to *Cronartium ribicola* [*R.A.M.*, vi, p. 522]. Conditions during the season in question were very favourable for the development of the disease in Norway, and the White Dutch variety in adjacent rows was moderately to heavily infected. In view of the fact that the Red Dutch variety has been found by the writer to be susceptible to *C. ribicola* in the United States, he made an inquiry into the identity of the resistant Norwegian strain, which appears to be quite distinct from the American Red Dutch (*Rubus sativum* hybrid group) and to belong to the group of *R. petraeum* and its hybrids [cf. ibid., ii. p. 483]. Further, the Norwegian authorities consulted were of opinion that their Red Dutch variety is identical with the Danish Red Spanish currant and possibly the English Rivers Late Red and Prince Albert. It is a heavy cropping variety of good quality.

During the period from April to June, 1929, a series of comparative inoculation experiments was carried out at the Edinburgh Botanic Garden on the Norwegian and American Red Dutch varieties, and also the very susceptible *R. aureum* and *R. nigrum*, with *C. ribicola* isolated from *Pinus strobus* and *P. monticola* in Scotland. With the exception of the Norwegian Red Dutch, all the varieties developed heavy infection. *R. petraeum* and *R. petraeum* var. *hirsutum* were inoculated in a separate test. The former was found to be susceptible, while in the latter the leaves just behind the growing tip of the shoot showed a marked resis-

tance to infection. Both in this variety and the Norwegian Red Dutch a pronounced 'flecking' was observed in the leaf tissues, but no spores were found, indicating that the fungus is capable of penetrating the leaf but not of further development. Associated with the necrosis in the Norwegian Red Dutch variety was the deposition of a tannin-like substance between the cells. Around this necrotic centre the spongy mesophyll and palisade cells were considerably swollen and generally devoid of chloroplasts. The necrotic flecks, held against the light, resembled glistening targets with dark 'bull's eyes' surrounded by more or less distinct zones of pale tissue. Viewed at an angle, the spots on the under side of the leaf showed as small, translucent blisters with dark centres.

PLAKIDAS (A. G.). **Report on Strawberry virus disease project.**—*Plant Disease Reporter*, xiii, 9, pp. 129–131, 1929.

A virus disease of strawberries, which has as yet been found only in the northern and eastern United States and Canada, is briefly described. It is stated to differ from xanthosis or yellows of the strawberry in the Pacific Coast States and strawberry dwarf of the southern States [*R.A.M.*, vii, pp. 650, 651]. The most conspicuous symptom of this disturbance is a pronounced yellowing, 90 per cent. of the leaf area being devoid of chlorophyll in extreme cases. The yellow colour is usually very pale—nearly albino. The affected leaves generally show a mosaic-like mottling and appear abnormally thin. Diseased plants are stunted and bear little fruit. The symptoms are reported to be most prominent during the cool spring months; in late summer they practically disappear. All the runner offsets of a diseased plant are affected, suggesting that the trouble is systemic. The name 'yellows' (not to be confused with the Californian xanthosis) is proposed for the new disease, pending further investigations of its etiology.

GASSNER (G.). **Wesen, Wirkung und Bewertung chemischer Pflanzenschutzmittel.** [Nature, action, and application of chemical plant protectives.]—*Zeitschr. für Angew. Chemie*, xlii, 35, pp. 865–869, 1929.

This is a discussion in general terms on the nature of the methods applicable to the control of plant diseases and pests, accompanied by some well-known examples of treatment with copper, sulphur, and mercury preparations, together with an elucidation of the system of testing fungicides to determine the chemotherapeutical index [*R.A.M.*, ii, p. 554].

GUYOT (A. L.). **De l'organisation comparée de la lutte chimique contre les ennemis des cultures en France et en Suisse.** [A comparison of the chemical control of crop pests in France and Switzerland.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 6–7, pp. 203–210, 1929.

The author divides chemical fungicides into three main categories: copper salts, sulphur-alkaline or sulphur-alkaline-earthy substances, and the complex organic salts of the heavy metals. He points out that while the fungicide most widely used in France is still Bordeaux mixture, in Switzerland preference is given to the

calcium polysulphides in the form of concentrated lime-sulphur, or to the polysulphide of barium sold under the trade name of 'solbar'. The latter is of German manufacture but the lime-sulphur mixtures used are made locally, and the various Swiss research stations are collaborating with the manufacturers in an effort to ensure that all mixtures sold shall be of a specified strength and fungicidal value. The different kinds of spraying apparatus in vogue in Switzerland are briefly described.

In most of the cantons arsenical compounds may be applied to fruit trees (except cherry and apricot) up to three weeks after flowering. The French Society of Plant Pathology and Agricultural Entomology has expressed the desire that legislation at present in force in France should be amended to include the apricot among those trees (apple, pear, plum, almond, and peach) which may receive arsenical applications from shortly after gathering the fruit until five weeks after flowering.

Holland (E. B.), Dunbar (C. O.), & Gilligan (G. M.). **Supplements for copper fungicides.**—*Massachusetts Agric. Exper. Stat. Bull.* 252, pp. 94–112, 1929.

In this account of an investigation (with the co-operation of E. F. Guba) made at Massachusetts Agricultural Experiment Station to determine the intrinsic and relative values of various [listed] substances recommended as supplements to copper fungicide mixtures, the authors point out that the efficacy of such mixtures depends upon their degree of dispersion, as determined by suspension, and on their wetting, spreading, and adhesive qualities. In order to become active the copper must be ionized as well as soluble, solubility alone not being a true criterion of the fungicidal activity of copper. Various organic compounds produce filterable copper, the activity of which is lower than that of soluble inorganic compounds which are readily ionized. Supplements added to copper mixtures may retard the formation of larger aggregates, crystallization, decomposition, and the interactions between non-compatibles.

Tests [the results of which are tabulated and discussed] were made to determine the effect of numerous substances on the suspension of Bordeaux mixture 4-2-50 made from different batches of dry laboratory-prepared hydrated lime soaked over night. The amount of protector added generally ranged from 0·008 to 0·16 per cent. of the spray. The best results in increasing the suspension were given by tannic acid, bentonite, and wilkinite, though quince seed extract, soap powder, and sodium silicate are also worthy of mention.

To secure satisfactory wetting [cf. *R.A.M.*, iv, p. 178] a low surface tension or the property of surface concentration is necessary, with, in some instances, a solvent action on the epidermal coating also. As no method exists for measuring interfacial tension between plant surfaces and the spray, and as the nature of the surface offered by the plant varies so considerably, it is impossible to foretell the action of added substances in this respect; an increase in wetting and spreading is, however, always desirable, and is secured mainly by reducing the interfacial tension.

The requisite supplements for the various surfaces must be determined largely by trial and error.

Tests made of the effects of various substances in improving the wetting and spreading qualities of basic copper sulphate showed that the best results were given by saponin, glue, calcium caseinate, soap, and wheat flour. Soap mixtures should, however, be applied immediately after preparation to avoid the formation of a curdy precipitate.

Attempts were also made to increase the adhesiveness by forming more resistant deposits, Bordeaux mixture 4–4–50 and basic copper sulphate [see next abstract] without an adhesive being used as controls. The Bordeaux mixture showed excellent retention, while the basic copper sulphate was less visible and gave only poor to fair retention. The addition of small amounts of well-dispersed wheat flour, glue, or Castile soap increased the adherence of the basic copper sulphate.

Of the various supplements tested, the best all-round results were given by wheat flour, glue or gelatine, soap, and tannic acid.

A bibliography of 97 titles is appended.

Holland (E. B.), Dunbar (C. O.), Gilligan (G. M.), & Doran (W. L.). **The preparation and effectiveness of basic copper sulfate as a fungicide.**—*Massachusetts Agric. Exper. Stat. Bull.* 254, pp. 123–149, 1929.

After summarizing the information contained in their previous paper [*R.A.M.*, vi, p. 175] concerning the preparation and the chemical and physical properties of basic copper sulphate, the authors give details of experiments made from 1925 to 1928, inclusive, to test the efficacy of several commercial preparations made by the method already described, or by various modifications of it, as compared with that of other fungicidal sprays and dusts. The results showed that low basic copper sulphate (0·25 per cent. Cu) used as a spray was as effective as, or even superior to, Bordeaux mixture of the same Cu content in the control of cucumber anthracnose (*Colletotrichum lagenarium*) and powdery mildew (*Erysiphe cichoracearum*), and early and late blights of celery (*Cercospora apii* and *Septoria apii*). Promising results were obtained with both basic copper sulphate sprays and dusts in the control of early and late blights of potatoes [*Alternaria solani* and *Phytophthora infestans*], but their effect on fruit trees and the vine requires to be further studied.

Among the spreaders tested, saponin was of value in increasing the wetting and spreading capacity of the sprays, and raw linseed oil in increasing their adhesiveness; the latter, however, is not recommended for use on cucumbers, celery, or potatoes. The dusts with talc distributed well and appeared to have good adhesivity.

Rischkow (V.). **Neue Daten über geaderte Panaschierung bei Evonymus japonicus und Evon. radicans.** [New data on veined mottling in *Euonymus japonicus* and *Euon. radicans*.] —*Biol. Zentralbl.*, xlvii, 12, pp. 752–764, 3 figs., 1927.

The mottling of the veins in the foliage of *Euonymus japonica fol. marmor*, investigated by the author at Kharkov [Ukraine], is stated

to be due to an infectious chlorosis identical with that described by Baur (*Ber. Deutsch. Bot. Gesellsch.*, xxvi, 1908) as occurring in *E. japonica fol. aureo-marginata* [cf. *R.A.M.*, vii, p. 385; viii, p. 662]. Other varieties similarly affected are *E. japonica fol. chlorino-marginata*, *E. japonica fol. aureo-maculata*, and *E. radicans*.

The chlorotic leaves develop pale stripes along the veins which fade or disappear completely with advancing age. The pale areas in the corresponding mesophyll tissues of the leaf, however, persist throughout the life of the foliage.

This infectious chlorosis was found to be readily transmissible by grafting, but apparently not by means of insects. The 'X-bodies' characteristic of mosaic disease were absent from the leaves showing symptoms of infectious chlorosis. Such leaves, however, bore a large number of intumescences on the diseased parts, from which it would appear that one effect of infectious chlorosis is a disposition to hyperhydric hypertrophy.

Rayner (Miss M. C.) & Llewellyn Smith (M.). **Phoma radicis callunae. A physiological study.**—*New Phytologist*, xxviii, 4, pp. 261–290, 1 pl., 4 graphs, 1929.

In continuation of previous investigations on the physiology of *Phoma radicis callunae*, the endophyte of *Calluna vulgaris* [*R.A.M.*, viii, p. 325], the writers describe at some length the technique of their isolation of the organism and its cultivation on agar media.

All the cultures showed a marked increase of alkalinity in the substratum (especially where nitrate was present) after six weeks' growth, a phenomenon attributed either to the production of ammonia in the course of metabolism, or of bicarbonate as an indirect result of the accumulation of CO_2. The endophyte utilized *Calluna* oil, starch, dextrose, and saccharose with equal facility as sources of carbon. The mycelium was found to possess a high degree of oxidizing activity and an efficient enzyme mechanism for protein hydrolysis, as indicated by the rapid liquefaction of gelatine.

Continuous culture of *P. radicis callunae* on the same nutrient was found to lead to complete and apparently irreversible loss of sporing capacity. Attempts to restore the reproductive function by exposure to radiation from a mercury vapour lamp on the lines of Stevens's experiments [ibid., viii, p. 190] gave negative results. At the same time it was observed that the shorter exposures produced no lethal effect on vegetative development, and even irradiation for one hour or longer only injured the aerial mycelium and failed to prevent the rapid growth of new hyphae from below. The occurrence of sectors characterized by weaker vegetative growth and the absence of pycnidia in agar cultures at an early stage of growth is tentatively interpreted as a result of the sudden appearance of a non-sporing saltation, but it is pointed out that various inconsistencies of reproduction require explanation before this view can be definitely accepted.

The significance of the more important cultural characters of the

endophyte of *C. vulgaris* is discussed in relation to the edaphic peculiarities of the Ericaceae.

CAPPELLETTI (C.). **Sterilità di origine micotica nella 'Ruta patavina' L.** [Mycotic sterility of *Ruta patavina* L.]—*Ann. di Botanica*, xviii, 2, pp. 145–166, 2 pl., 1929.

An investigation [details of which are given] of the gradual extinction of *Ruta patavina* plants from two localities in Italy showed that this was due to the production of abortive embryos owing to severe infection of the roots by a fungus with intercellular hyphae, haustoria, and vesicles, resembling those described in endotrophic mycorrhiza. Isolations from these roots yielded a species of *Penicillium*. When the plants were transplanted into less heavily infected soil they produced morphologically normal seeds.

SCOTT (I. T.). **Hydrogen-ion equilibrium of mycelial mats of Fusarium lycopersici in salt solutions and its relation to growth and toxicity.**—*Amer. Journ. of Botany*, xvi, 8, pp. 631–643, 3 graphs, 1929.

Continuing his investigations on the physiology of *Fusarium lycopersici*, the writer tested the effect of dilute solutions of 42 single salts, acids, and alkalies [which are enumerated] at different P_H values on living mycelial mats of the fungus thoroughly washed in distilled water [*R.A.M.*, vi, p. 367]. In all cases where the solution was not toxic to the fungus the reaction was shifted to an equilibrium point at P_H 5·4 to 5·5. With toxic solutions anomalous results were obtained, the shift in reaction in some cases being rather away from than towards the equilibrium point. The reaction of distilled water was not shifted in this way.

Ground dried mycelium was dialysed through a collodion bag and the dialysate and non-dialysable fractions were titrated against 0·1 *N* HCl and 0·1 *N* KOH. Both fractions showed considerable buffer action, which was greater for the dialysate with KOH than with the non-dialysable fraction.

The growth of the fungus was greatly inhibited in culture solutions initially more acid than P_H 5·5 when the toxic salts KCN or KI were present at concentrations near their toxic limits. On the other hand, the addition of the toxic salts $HgCl_2$ or $CuSO_4$ to the nutrient solutions produced the most marked inhibition of growth on the alkaline side of P_H 5·5.

These phenomena are thought to be partially explicable by the assumption of a protein analogy for the fungous tissue, and the existence of an isoelectric point at P_H 5·4 to 5·5.

MURPHY (P. A.) & MCKAY (R.). **The insect vectors of the leaf roll disease of the Potato.**— *Scient. Proc. Roy. Dublin Soc.*, xix (N.S.), 20–28, pp. 341–353, 1929.

In a summary review of the work hitherto done on the transmission of potato leaf roll [most of which has been noticed in this *Review*] the authors give a list of the insects that have been held responsible by various investigators for the dissemination of the disease in the field, and then describe their experiments from 1922

to 1928, inclusive, for the most part with plants grown in pots under insect-proof cages or in insect-proof greenhouses. Successful leaf roll infection was secured with *Myzus persicae* in 19 out of 25 tests, with *M. pseudosolani* in 2 out of 40, with *Macrosiphum solanifolii* [*M. gei*] in 1 out of 151, and with unidentified aphids in 5 out of 34 tests. These results indicate that *Myzus persicae* possesses a facility for transmitting leaf roll which is not shared by the other aphids tested [*R.A.M.*, viii, p. 804], but that *M. pseudosolani* and *M. gei* are also capable, at least occasionally, of transmitting the disease, and the same is also believed to be true of the capsid *Calocoris bipunctatus*.

The experiments showed that *M. persicae* is able to transmit leaf roll from potato plants at any stage of development to new hosts, no matter in what stage of growth. The symptoms are quicker to develop, however, when the inoculated plant and the one supplying the inoculum are still young; when either or both are old, infection (at least such as can reach the tubers) is rendered more difficult. The character of the first symptoms to develop depends on the age of the inoculated plant, and not on the nature of the source. Infection of the sprouts of unplanted tubers results in the development of secondary leaf roll very early in the season. Infection of the foliage of young plants produces primary leaf roll, more or less rapidly passing into secondary. When plants are not infected until nearly full-grown, primary leaf roll alone appears, and there is no further development during the same season. Infection at a somewhat later stage does not produce any apparent symptoms in that season, and the tubers of such plants may escape infection altogether, or some of them may become diseased and some remain healthy.

Pittman (H. A.). **Potato diseases in Western Australia.**—*Journ. Dept. Agric. Western Australia*, 2nd. Ser., vi, 3, pp. 398–404, 5 figs., 1929.

Continuing his account of the diseases of potatoes in Western Australia [*R.A.M.*, viii, p. 804], the author gives a brief description in popular terms of the symptoms and control of Irish blight (*Phytophthora infestans*). Owing to the climate the disease is not common in Western Australia, and though first reported there in 1909 has never attained epidemic proportions. In September and October, 1928, it appeared at widely scattered points in this region, but did comparatively little damage.

Collins (W. E.). **Certification of seed Potatoes. Review of season 1928–29.**—*Journ. Dept. Agric. Western Australia*, 2nd. Ser., vi, 3, pp. 447–448, 1929.

During the past seven years a system of certification of seed potatoes has been developed in Western Australia to make available a supply of more or less standardized seed potatoes of good quality and productiveness. Crops entered for certification are inspected twice during the growing period and again at digging, the main requirements being trueness to name and type and relative freedom from disease. In two localities the yield from the certified strains was 4 to 6 tons per acre more than that of the uncertified.

Kansas Potato inspection-law, rules and regulations.—*Twenty-sixth Bienn. Rept. State Board of Agric. Kansas*, xxxi (*1927–1928*), pp. 179–187, 1929.

In accordance with a State law taking effect from 21st March, 1927, Grade 1 potatoes destined for export from the State of Kansas shall conform as regards 75 per cent. to the quality standard of United States Grade 1 for freedom from various injuries, including damage from hollow heart [*R.A.M.*, viii, p. 401], scab [*Actinomyces scabies*], blight [*Phytophthora infestans*], soft rot [*Fusarium* and other causes), and dry rot [*F.* spp.], while the remaining 25 per cent. must comply with the standard defined by U. S. Grade 2, which requires freedom from serious damage due to the above-mentioned causes [cf. ibid., viii, p. 522].

Reiling (H.). **Schorf und Schalenmängel der Kartoffelknolle.** [Scab and skin defects of the Potato tuber.]—*Deutsche Landw. Presse*, lvi, 38, p. 545, 10 figs., 1929.

Popular notes are given on the various types of scab produced on potato tubers in Germany by *Actinomyces* [*scabies*: *R.A.M.*, viii, p. 595] and physiological causes, with a brief reference to scurf (*Hypochnus* [*Corticium*] *solani*).

Reiling (H.). **Die Pflanzkartoffel im Handel.** [The seed potato in commerce.]—*Illus. Landw. Zeit.*, xlix, 50, pp. 583–584, 8 figs. (3 on p. 582), 1929.

Attention is drawn to some minor defects of seed potatoes which frequently detract from their market value—in many cases unnecessarily. These include mild scab [*Actinomyces scabies*: see preceding abstract], sprain [but see next abstract], hollow heart [*R.A.M.*, viii, p. 458], and other relatively insignificant disturbances. An attempt should be made to enlighten traders as to the true nature of potato diseases, so that they may differentiate between serious transmissible defects and trivial blemishes which have no effect on the progeny, thereby avoiding much unnecessary waste. Some suggestions are made for various forms of educational propaganda.

Fruwirth (C.). **Vererbliche Eisenfleckigkeit bei Kartoffeln.** [Hereditary sprain in Potatoes.]—*Deutsche Landw. Presse*, lvi, 2, p. 18, 1929.

A brief account is given of the writer's observations at Mezölack (Hungary) in connexion with the transmission of sprain (eisenfleckigkeit) of potatoes [*R.A.M.*, v, p. 572]. In 1927, among 36 progenies resulting from a single cross between Industrie and Bellona (vegetative F_2), one showed symptoms of sprain in every plant in the vegetative F_2 generation, while all the others remained healthy. Tubers from the diseased progeny (vegetative F_3) were planted in the writer's experimental garden, and again yielded plants showing the typical symptoms of sprain. The soil reaction in both localities is P_H 7·06. None of the remaining progenies of this or any of the author's other crosses made at the same time showed any sign of the disease. In the 1928 crosses again, however, one of the progenies of a cross between Deodara and Gratiola

consisted, in the vegetative F_2 generation, of uniformly diseased plants, while the four other progenies of the same cross were quite healthy. Evidently, therefore, sprain is in some cases hereditarily transmissible, and the careful inspection of tubers destined for propagation is essential.

CHIAPPELLI (R.). **Risaie colpite dall' Helminthosporium oryzae.** [Rice fields invaded by *Helminthosporium oryzae.*]—*Giorn. di Risicolt.*, xix, 10, pp. 155–156, 2 figs., 1929.

Popular notes are given on the occurrence of *Helminthosporium oryzae* [*R.A.M.*, viii, p. 530] in the irrigated rice fields of two districts of Italy in 1929. The affected plants were stunted, discoloured, and the leaves largely withered. The symptoms of *H. oryzae* are stated to be readily confused with those of 'brusone' [*Piricularia oryzae*: ibid., viii, p. 460]. The attacks of the *Helminthosporium* are believed to have been favoured by waterlogging.

FERRARIS (T.). **Il 'mal del collo' del Riso e l' 'Helminthosporium oryzae' B. d. H.** [Stem disease of Rice and *Helminthosporium oryzae* B. d. H.]—*Rivista Agricola*, xxv, 576, p. 594, 1929.

During 1929 *Helminthosporium oryzae* [see preceding abstract] was very prevalent in the rice-growing areas of north Italy, especially in new rice fields and those which had received excessive applications of nitrogenous dressings; early varieties (Chinese originario, l'Americano 1600, and Maratelli) were the most severely affected. The symptoms of the disease [which are briefly described] closely resemble those of true 'brusone' due to *Piricularia oryzae.* Control is recommended by improved cultural practices and the use of resistant varieties.

MURRAY (R. K. S.). **A preliminary note on a disease of young Rubber buddings.**—*Trop. Agriculturist*, lxxiii, 4, pp. 238–239, 1929.

An examination of diseased young shoots of bud-grafted *Hevea* rubber from two estates in the Kalutara district of Ceylon showed that they had been attacked originally about three inches from the tip; there was a sunken, discoloured area about six inches long on one side. Both shoots bore the fructifications of *Gloeosporium alborubrum* [*R.A.M.*, iv, p. 239], but a *Phytophthora* was also present, and inoculations with the latter reproduced the disease in wounded and unwounded young green shoots of *Hevea* seedlings. On the inoculated shoots the disease first appeared as blackish, watery, vertical streaks, which after six days merged into black, sunken areas, 1 to 2 in. long, bearing the sporangiophores and sporangia of the fungus. Later, the disease spread along the shoots and invasion by secondary fungi took place. One month after inoculation the shoots had died back for about 1 ft. from the tip, but owing, probably, to abnormally dry weather the die-back was checked at this stage and new shoots developed below the affected parts.

The fungus was not identified with any of the previously described

tropical species of *Phytophthora* ; the size and shape of the sporangia varied appreciably according to the weather. Reference is made to the similar disease of *Hevea* rubber associated with a *Phytophthora* but originating at the extremity of the shoot, recently reported by Weir from Malaya [ibid., viii, p. 523].

Janke (A.) & Holzer (H.). **Über die Schimmelpilzflora des Bodens.** [On the fungous flora of the soil.]—*Centralbl. für Bakt.*, Ab. 2, lxxix, 1–7, 13 figs., 1929.

An investigation [the technique of which is described and the results fully discussed] of the fungous flora of the soils in the low-lying country surrounding Vienna [cf. *R.A.M.*, viii, p. 334 *et passim*] showed that the Aspergillaceae predominate with a total of 30 species from 6 soils (4 uncultivated and 2 cultivated), represented by 20 species of *Penicillium*, 4 of *Citromyces*, 2 of *Scopulariopsis*, and 4 of *Aspergillus*. The Fungi Imperfecti followed with 10 species of *Fusarium* (of which only *F. discolor*, *F. rubiginosum* [*F. culmorum*: ibid., vii, p. 710], and *F. solani* could be identified), 2 each of *Trichoderma* (*T. koningi* and *T. lignorum*) and *Torula*, and 1 each of *Geotrichum* (*G. candidum*), *Cephalosporium* (*C. asperum*), *Acrostalagmus* (*A. fungicola*), *Humicola*, *Synsporium* (*S. biguttatum*), *Cladosporium* (*C. herbarum*), and *Septosporium*. The Mucorineae were represented by species of *Mucor*, *Absidia*, *Rhizopus*, *Cunninghamella*, *Mortierella*, and *Zygorrhynchus*.

The germination percentages of the fungi isolated from the peat and marshy soils were relatively low, while these soils were also inferior to the cultivated ones in the number of species represented. The Mucorineae were found both in cultivated and uncultivated soils (beech forests, marshes, and peat). The Aspergillaceae predominated in forest soils, but also formed a fair proportion of the potato field and vineyard totals. There were no Fungi Imperfecti in the peat soils, presumably on account of the strongly acid reaction (P_H 5·3). Even the *Trichoderma* species found by Waksman predominantly in damp, acid soils [ibid., v, p. 763], and isolated in the present tests from beech forest and marsh (P_H 6·04 and 6·58, respectively), were absent. The repeated occurrence of *Fusarium* spp. in cultivated soils, especially in potato fields and vineyards, was noticeable.

Gelatine was rapidly liquefied by most of the fungi in question, especially *Aspergillus*, *Trichoderma*, *Cladosporium*, and *Fusarium* spp. Cellulose was disintegrated by five, none of which was represented in peat soils. Fat was decomposed by 13 species, of which *Mucor flavus* was the most active.

A relationship was traced between the genera *Acrostalagmus* and *Monosporium* inasmuch as *A. fungicola* may exhibit the characters of either genus according to the nutritional conditions provided for it.

Waksman (S. A.) & Stevens (K. R.). **Contribution to the chemical composition of peat: V. The rôle of microörganisms in peat formation and decomposition.**—*Soil Sci.*, xxviii, 4, pp. 315–340, 2 graphs, 1929.

Details are given of an investigation which was carried out by

the authors in different peat bogs of New Jersey, Maine, and Florida, and the results of which are stated to have shown conclusively that micro-organisms play a highly important part in the formation of peat from plant remains. In low moor peat bogs the largest number of fungi, aerobic cellulose-decomposing bacteria, and nitrifying bacteria (as determined by the plating method) occur at or just below the surface, and diminish rapidly with depth. All the organisms usually disappear completely at a depth of 75 to 90 cm., except species of *Actinomyces* and sometimes anaerobic bacteria, which continue to occur to a depth of 120 to 150 cm. In acid sphagnum peat fungi were present on the surface but not below.

Details are also given of experiments which were conducted to ascertain the part played by the micro-organism in the decomposition of peat, in so far as they result in the liberation of the constituent elements, especially nitrogen and carbon, in forms available for plant growth. The results showed that certain fungi in pure culture (e. g. species of *Trichoderma* and *Actinomyces*) can decompose sterilized peat as rapidly as the total population of micro-organisms present in it. Nitrates were formed in appreciable amounts, however, only when soil suspensions were used as inoculum, while when fungi alone were used, all the nitrogen liberated was in the form of ammonia. The addition of cellulose brought about a rapid increase in the number of fungi (species of *Cephalosporium*, *Fusarium*, *Trichoderma*, *Humicola*, *Penicillium*), and that of rye straw added species of Mucorales to this list. Treatment of the peat with ether, toluene, or dilute hydrochloric acid, followed by the removal of the reagent, was shown markedly to increase the rapidity of decomposition, not so much owing to any change in the balance of the microbial population, as to the removal of waxy substances, thus rendering the peat more readily susceptible to the action of the micro-organisms.

Taubenhaus (J. J.), Bach (W. J.), & Ezekiel (W. N.). **Anise drop.**—*Plant Disease Reporter*, xiii, 10, p. 141, 1929.

Sweet fennel or anise (*Foeniculum vulgare*), which is extensively grown (mainly for export to eastern markets) in the lower Rio Grande Valley of Texas, was observed in March, 1929, to show symptoms of collapse. The lower ends of the drooping leaves were soft, slimy, and covered with a quantity of white hyphae and masses of large sclerotia believed to be those of *Sclerotinia sclerotiorum* [*R.A.M.*, viii, p. 419]. These bodies were also scattered on the ground and were further found on and in the diseased petioles. The centres of the diseased plants were pale yellow and wilted. In extreme cases the organism was found advancing from the basal leaves to the upper parts of the plants, which presented a typical 'drop' appearance. The loss resulting from this disease is estimated at 5 to 10 per cent. This is believed to be the first record of a *Sclerotinia* on fennel.

McClean (A. P. D.). **Sugar-Cane diseases in South Africa.**—*South African Sugar Journ.*, xiii, 9, pp. 573, 575, 577, 579, 1929.

In this paper (read before the Pan-African Agricultural Confer-

ence, Pretoria, in August, 1929) the author gives a concise account of the present situation with regard to the following sugar-cane diseases in South Africa [cf. *R.A.M.*, i, p. 271]: mosaic, streak, ring spot (*Leptosphaeria sacchari*), eye spot (*Helminthosporium sacchari*), red rot [wilt] (*Cephalosporium sacchari*), rind disease (*Melanconium sacchari*), and cold or sectional chlorosis [ibid., vii, p. 808]. Of these, only the two first-named are of any special significance.

North (D. S.). **The bacterial-vascular diseases of Sugar-Cane. A paper read before the Third Conference, International Society of Sugar-Cane Technologists, Sourabaya, Java.**—*Facts about Sugar*, xxiv, 37, pp. 880–881, 1929.

In this brief summary of recent investigations on gumming disease and leaf scald of sugar-cane [*Bacterium vascularum* and *Bact. albilineans*: *R.A.M.*, viii, p. 809; ix, p. 20] in Australia, it is stated that *Lucilia sericata*, *Calliphora augur*, *Sarcophaga* sp., and two other species of flies are capable of transmitting the former from infected to healthy leaves. The resistance of *Bact. vascularum* to sunlight, heat, and desiccation was found to be increased by the gum uniting the bacteria. Thus the organisms, when well separated, are killed by ten minutes' exposure to direct sunlight or heating at 49° to 50° C. in a fluid suspension, whereas in the form of gum droplets they survive 32 hours in direct sunlight on glass and 4½ hours on a steel cane knife at 50°. Droplets of gum also survive 12 weeks' exposure to air-drying compared with 4 to 5 days for the separated bacteria. Mixed with moist soil all the bacteria perished in four days, but they lived for a fortnight in air-dried soil. It is evident, therefore, that soil infection can rarely, if ever, occur.

The saccharose-peptone agar medium used by Miss Wilbrink (*Arch. voor Suikerind.*, xxviii, p. 1399, 1920) has been found superior to any others tested by the author for the cultivation of *Bact. vascularum* and *Bact. albilineans*.

Atanasoff (D.) & Kovačevski (I. C.). Нови паразитни гѫби за България. (1-ви приносъ). [Parasitic fungi new for Bulgaria. (First contribution).]—*Bull. Soc. Bot. de Bulgarie*, Sofia, iii, pp. 45–52, 1929. [English summary.]

In this paper brief notes are given on two species of bacteria and 22 species of parasitic fungi which are stated to be new records for Bulgaria, and among which the following are of phytopathological interest. Bacterial scorch (*Bacterium phaseoli*) of French beans occurs in a severe form practically over the whole of the country. In several localities the same crop is also attacked by bacterial wilt (*Bact. flaccumfaciens*). A detailed account of both organisms is in course of preparation. *Phytophthora erythroseptica* was isolated in 1927 from potato tubers grown in the neighbourhood of Sofia. The rot caused by it is of a uniform pinkish-yellow to yellowish-grey colour, gradually changing to pinkish-brown and finally to black, and the affected tissues appear water soaked. *P. nicotianae* was first identified in 1927 in one locality of Bulgaria, and is stated to cause important losses to tobacco in the whole south-western

tobacco-growing region, as it damps off seedlings and attacks the plant at all stages of development, forming black spots on the stems and leaves. Besides tobacco, *P. nicotianae* was also found parasitizing the castor bean (*Ricinus communis*), eggplant, tomato, and *Commelina nudiflora*. *Sclerospora macrospora* was found in two localities attacking rye, this being stated to be the first record of the fungus on this host. Primary infection appears to occur in the spring just before the tillering stage, and all the organs may be invaded. The chief symptoms, however, appear on the leaves, in the form of light to dark brown spots which begin to develop at the apex or at the periphery of the leaves, gradually extending downwards and inwards. Infected plants remain stunted and either fail to produce ears or those that develop are badly deformed. All the invaded tissues contain numerous oospores of the fungus, which measure from 40 to 60 μ in diameter. In 1928 some fields of chick pea (*Cicer arietinum*) were attacked by *Uromyces ciceris-arietini*, which formed rusty-red uredosori on both sides of the leaves, and by *Phyllosticta rabiei* [*R.A.M.*, vii, p. 357]; the latter forms on the pods, and occasionally on the leaves and stems, numerous round, ochre-yellow to greyish-brown spots, 4 to 5 mm. in diameter, with a dark brown margin, bearing black pycnidia up to 74 μ in diameter; the pycnospores are continuous, hyaline, cylindrical with tapering ends or ovoid, and measure 10 to 12 by 4 to 5 μ. *Coniothyrium wernsdorffiae* [ibid., vii, p. 446] was recorded in 1929 on Crimson Rambler roses, on the branches of which it formed large, frequently coalescing spots, from 5 to 6 cm. or more in diameter. *C. concentricum* was found on the leaves of *Yucca filamentosa*, forming elliptical, amphigenous spots, from 2 to 3 cm. in diameter, yellowish-grey in the centre and dark brown at the periphery. The pycnidia are lenticular, 160 to 200 μ in diameter, and contain yellowish-brown, oval to ovoid spores, which measure 4 to 5 by 4 μ. *Verticillium dahliae* was isolated from potato tubers grown in the neighbourhood of Sofia. *Piriculuria oryzae* was recorded in 1927 and 1928 on rice, causing a foot rot and leaf spots; the diseased plants were stunted and failed to set grain. *Helminthosporium sativum* was isolated from wheat grains.

Overholts (L. O.). **Mycological notes for 1926–27.**—*Mycologia*, xxi, 5, pp. 274–287, 4 pl., 1929.

In this further series of mycological notes [*R.A.M.*, vi, p. 8] the following references may be of phytopathological interest. *Phyllosticta castaneae* was found in 1925 on living leaves of *Castanea dentata* in Pennsylvania; the pycnidia were immersed and most conspicuous on the lower surface of the leaves, being hardly discernible from the upper surface. *Sclerotium bifrons* Ellis & Everh. is fairly common in New England on the leaves of the aspen (*Populus tremuloides*), on which it forms small black, tar-like, epiphyllous spots. In May, 1926, a fungus was collected on overwintered leaves of *Quercus prinus*, which appears to be the perfect stage of *Phyllosticta maculiformis* and is referable to *Mycosphaerella maculiformis* (Pers.) Peck; in collections that were just beginning to mature the ascospores measured 7 to 9 by 1·5 to 2 μ, these dimensions being smaller than those given by other workers

(9 to 14 by 3 to 4 μ). A species of *Valsa* which is referred to *V. abietis* occurred in 1922 at the State College, Pennsylvania, on recently killed young trees of *Thuja orientalis*, no other organism likely to be responsible for the death of the trees being found. *V. collicula* (which the author had previously considered to be *V. pini* [ibid., vi, p. 683]) was recorded on a very recently killed sapling of *Pinus strobus* from Pennsylvania and on a tree of the same species which was girdled with a basal canker of the type sometimes attributed to ant injury.

Dade (H. A.). **Minor records, Division of Mycology, 1928.**—*Gold Coast Dept. of Agric. Year Book 1928* (*Bull.* 16), pp. 250–253, 3 pl., 1929.

The following are stated to be new records for the Gold Coast: *Choanephora cucurbitarum* [*R.A.M.*, iv, p. 254] occurred on papaw leaves, cacao husks, and withered blossoms of *Hibiscus* and *Zephyranthes* (probably saprophytic on the first-named host). The local form of the fungus is characterized by a feature apparently not yet mentioned in the literature on the subject, viz., the regular longitudinal dehiscence of the sporangium to permit the escape of the sporangiospores. A technical description of the organism is given. *Sclerotium rolfsii* attacked *Pistia stratiotes*, a new host for the fungus and of special interest as water plants are normally immune from infection. *Fomes lamaoensis* was found causing the collapse of a cacao tree about 8 ft. from the ground. The fructifications were observed on the fallen part of the trunk, while the upper part of the standing trunk was invested in the typical matted hairy stroma of the fungus, deep brown in the older parts and white at the lower advancing edges.

Tamiya (H.) & Morita (S.). **Bibliographie von Aspergillus. 1729 bis 1928. (Fortsetzungen III–VIII).** [Bibliography of *Aspergillus*. 1729 to 1928. (Continuations III–VIII).]—*Bot. Mag.*, Tokyo, xliii, 509, pp. 237–249; 510, pp. 281–291; 511, pp. 321–332; 512, pp. 371–381; 513, pp. 427–433; 514, pp. 501–515, 1929.

These continuations of the authors' comprehensive bibliography of the genus *Aspergillus* from 1729 to 1928 comprise 955 titles extending over the period from 1894 to 1913, inclusive [*R.A.M.*, viii, p. 605].

Hiratsuka (N.). **Chrysomyxa of Japan. (Notes on the Melampsoraceae of Japan II.)**—*Bot. Mag.*, Tokyo, xliii, 513, pp. 466–478, 1929.

Historical, geographical, and taxonomic notes are given on eleven species of *Chrysomyxa* occurring in Japan, of which the following are found in the aecidial stage on conifers: *C. ledi* [*R.A.M.*, viii, p. 344] and *C. expansa* on *Picea jezoensis*, and *C. abietis* on *P. glehni*.

Leonian (L. H.). **Studies on the variability and dissociations in the genus Fusarium.**—*Phytopath.*, xix, 9, pp. 753–868, 16 pl., 1929.

In this paper (to which a preface is contributed by C. D. Sherba-

koff), the writer gives a comprehensive account of his studies of about 220 cultures of *Fusarium* obtained from various sources under 96 different specific and varietal names [cf. *R.A.M.*, iv, p. 705].

The following characters were used as variability tests. (1) Growth rate of colonies. (2) Production of colour and spore masses on five different nutrient agars. (3) Sporulation on malt extract agar. (4) Growth at 5°, 34°, and 37·5° C. (5) Growth in presence of various growth-inhibiting chemical substances, namely, nine different concentrations of tartaric acid, two concentrations of tannin, two of mercurochrome, five of malachite green, two of iodic acid, one of phenyl acetic acid, two of sodium dinitrophenoxide, and three of sodium tribromphenate. The behaviour of all the strains studied in relation to each of these characters is expressed in a series of lengthy tables.

It is concluded that, notwithstanding the inconsistency of certain morphological and physiological characters, a certain specific line of behaviour persists throughout all the strains and variants of a given species, the path of which may run in a zigzag line but does not seem to exceed the specific orbit.

Many of the supposedly pure cultures showed segmentations in the colonies, which were isolated. These the author terms variants. Some of the variants maintained their differences from the parent types, while others reverted to the original type or repeatedly fluctuated backwards and forwards.

The reaction and behaviour of many of the organisms used in the experiments were decidedly erratic even under controlled conditions, but Sherbakoff states in the preface that, while the details of the present taxonomy of the genus are unsatisfactory, its foundation is, in his opinion, sound, though certainly it might be advantageously reinforced by the study of physiological characters.

Capus (G.), Leulliot (F.), Foëx (E.). **Le Tabac. Tome deuxième: Pathologie—Dessiccation—Préparation.** [Tobacco. Volume Two: Pathology—Drying—Preparation.]—430 pp., 141 figs., Paris, Société d'Éditions Géographiques, Maritimes et Coloniales, 1929.

Of the 430 pages of this comprehensive and copiously illustrated treatise on the pathology, drying, curing, and commercial preparation of tobacco, 236 are devoted to diseases, including physiological and traumatic conditions and those developing in the curing barns. Mosaic and other virus diseases occupy 92 pages, bacterial diseases 45 pages, and fungal diseases 61 pages; extensive bibliographical lists are given at the end of each chapter, and the chief diseases discussed are well illustrated. The European and American literature is fully summarized, and that dealing with the pathology of the tobacco plant under tropical conditions is not neglected. Altogether the volume provides a comprehensive survey of the work done up to date on the diseases of this important crop and is likely to prove of great value to all concerned with their study or control.

Johnson (J.) & Ogden (W. B.). **The overwintering of the Tobacco mosaic virus.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 95, 25 pp., 1929.

A full account is given of investigations conducted in Wisconsin to test the survival, after exposure to different environmental conditions such as exist on tobacco farms, of the virus of tobacco mosaic in infected material from dead host plants grown in previous seasons. The results [which are tabulated and discussed] may be summarized as follows.

The ability of the virus to exist for long periods in dead plant material is an important factor in its overwintering in the curing shed and the soil. Much of the mosaic in the field is due to seed-bed infection, which may result from tobacco or tobacco refuse transferred to the seed-beds in the spring or from the virus overwintering in the soil of the seed-bed; field infections may also result from tobacco or tobacco refuse from curing barns or warehouses, but usually they result from field refuse, stubble, and roots from a preceding infested crop. When mosaic extract is introduced into soil, its persistence depends on a number of factors, type of soil, amount of air and water, temperature, and the like. Filter-sterilized mosaic extract added to sterilized soil caused disease in plants inoculated with the soil extract more than six months later. Moist, well-aerated soils favour the inactivation of the virus, which was often recovered during spring from soils as well as from roots which had remained in the field throughout the winter. Tobacco transplanted from the same seed-beds to infected fields and other fields virtually free from mosaic repeatedly showed heavy infection in the former and very light infection in the latter. Ordinarily, however, tobacco does not become easily or rapidly infected from mosaic-infested soil, much of the late infection being due to cultural operations.

It is considered that control measures must take more into account the overwintering of the virus in the soil and, consequently, the relation of crop rotation to control.

Săvulescu (T.) & Radulescu (I.). **Une nouvelle maladie bactérienne des feuilles du Tabac en Roumanie.** [A new bacterial disease of Tobacco leaves in Rumania.]—Reprinted from *Trav. Inst. Recherches Agron. de Roumanie*, 52 pp., 27 pl. (1 col.), 5 figs., 1929.

This is an extensive account of the so-called 'Wisconsin leaf spot' of tobacco (*Bacterium melleum*), an outbreak of which was discovered in Rumania in June, 1929, affecting plantations in the Danube valley. Full details are given concerning the morphology and physiology of the causal organism, which is described as a capsulate, rod-shaped bacterium measuring 1·9 to 3·8 by 0·6 μ, furnished with 3 (or occasionally 1 to 7) polar flagella 3 to 5 times longer than itself, forming circular, greyish colonies (with an orange tinge on an agar + bouillon + potato extract + glucose medium), liquefying glycerine in 15 to 20 days, and coagulating milk. The best growth is made at 25° to 28° C., with a maximum at 37°. The bacterium is not killed at 0°, though no development

occurs at this point, but may be destroyed by 10 minutes' exposure to a temperature of 57°.

The cells underlying the leaf spots cease to grow, while the surrounding healthy ones develop normally. Hence the diseased leaves become contorted. Then the infected portions fall out, giving a perforated appearance. The cells of the chlorotic halo surrounding the spots are completely devoid of chlorophyll, though bacteria are not present in them. In infected cells the plastids gradually disintegrate and the living substance is slowly consumed. The epidermal cells contract and turn brown or dissolve altogether. Pockets full of gum containing bacteria are sometimes found below the stomata. The organisms occupy the living cells and the intercellular spaces. The complete disintegration of the living content of the mesophyll cells is favoured by moisture, the lesions spreading with extreme rapidity after rain.

The results of inoculation experiments carried out through wounds with suspensions of *Bact. melleum* on various species of *Nicotiana*, a number of other Solanaceae, and 261 plants of different families are fully described and tabulated. Characteristic infection was produced on *N. affinis*, *N. longiflora*, *N. tabacum* var. *angustifolia*, and other species; *Physalis alkekengi*, three species of *Datura* (*D. stramonium* was found naturally infected in the vicinity of the plantations), *Atropa belladonna*, *Hyoscyamus niger*, *Solanum dulcamara*, and other Solanaceae; *Atriplex hortensis*, spinach, various species of *Cucurbita*, *Lagenaria vulgaris*, *Luffa cylindrica*, and various species of *Phaseolus*, including *P. lunatus*. In a large number of other cases the typical symptoms of infection were arrested after varying periods.

On tobacco the best varieties, Yaka and Suluk, were most seriously affected, Ghimpatzi and Herzegovina being relatively resistant. Primary infection, which is greatly favoured by high humidity, occurs in the seed-bed, contact of the unwounded leaves of the seedlings with infected soil being sufficient to cause infection.

Seed disinfection with 0·25 per cent. formalin for 15 minutes or with copper carbonate dust [quantity not specified], coupled with sanitary measures, may be recommended, on the basis of the authors' experiments, for the control of this disease. [A short note on this outbreak is given in the *Internat. Bull. of Plant Protect.*, iii, 10, pp. 149–150, 1929.]

Legislative and administrative measures. Italy.—*Internat. Bull. of Plant Protect.*, iii, 11, p. 171, 1929.

In order to arrest the spread of the 'mal secco' disease of citrus trees [*Colletotrichum gloeosporioides*: *R.A.M.*, viii, p. 547], a decree of the Prefect of the province of Catania, dated 19th August, 1929, enforces the excision and burning of any branches infected by the fungus within the territory of 14 communes [which are listed], the work to be carried out by the farmer of the land on which the trees are growing.

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DUFRÉNOY [J.] & SAREJANNI [J.]. **Transformations pathologiques de matières albuminoïdes chez des Tabacs.** [Pathological transformations of albuminoid substances in Tobacco.]—*Ann. Sci. Agron.*, xlvi, 5, pp. 604–610, 6 figs., 1929.

Further details are given of the writers' cytological studies on tobacco mosaic [*R.A.M.*, viii, pp. 677, 678]. The intracellular protein crystals normally present in tobacco leaves become more numerous and voluminous in those affected by mosaic. The petals of mosaic-infected tobacco flowers assume a red or pink coloration due to the presence of anthocyanin; the cell vacuoles of these organs contain large quantities of calcium oxalate either in the form of sand or as elongated needles [cf. ibid., vii, p. 797].

DUFRÉNOY (J.), SAREJANNI (J.), & STAMATINIS (N.). **Étude expérimentale d'une maladie bactérienne du Tabac.** [An experimental study of a bacterial disease of Tobacco.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 6–7, pp. 186–192, 14 figs., 1929.

A strain of the bacteria isolated from tobacco plants in Alsace showing symptoms closely resembling those of wildfire (*Bacterium tabacum*) [*R.A.M.*, viii, p. 150] was found to have biochemical characters identical with those described by American workers for the latter and for *Bact. angulatum*, which are stated to be practically identical with one another in these respects. When aseptically grown tobacco plants were inoculated with the Alsatian strain the bacteria developed abundantly between the parenchymatous cells of young stalks and roots, often forming thick zoogloeae in which the rods were widely spaced. Inoculations on the leaves gave the round lesions with a translucent margin that are characteristic of wildfire. The cells of the inoculated parts of the leaves showed a fatty degeneration and the presence of oil drops in the plastids; starch grains were also present, though less numerous than in the green cells. The vacuoles in the cells of the lesions contained much calcium oxalate.

KOTTE (W.). **Aufgaben des Pflanzenschutzes im Tabakbau.** [Functions of plant protection in Tobacco cultivation.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xliv, 44, pp. 984–986, 2 figs., 1929.

Directions are given in popular terms for the control of the two most important diseases of tobacco seedlings in Germany, viz., damping-off (*Pythium de Baryanum*) and wildfire (*Bacterium*

tabacum) [*R.A.M.*, ix, p. 137]. Measures calculated to reduce the incidence of seed-bed infection include the selection of a site on light, non-encrusting soil, sparse sowing, use of synthetic fertilizers in preference to organic manure, and careful regulation of warmth and moisture. It is advisable to divide up the seed-beds by wooden partitions, which should be disinfected every year before use with 10 per cent. copper sulphate or 0·5 per cent. germisan or uspulun. Further experiments and observations are necessary to establish the value of seed treatment and spraying in the control of these diseases.

Van Der Meer (J[ikke] H. H.). **Invloed van den vochtigheidstoestand van den grond op de slijmziekte, veroorzaakt door Bacterium solanacearum.** [Influence of the degree of humidity in the soil on the slime disease caused by *Bacterium solanacearum*.]—*Bull. Deli Proefstat. te Medan-Sumatra*, 29, 55 pp., 8 pl., 1929. [English summary.]

A full account is given of the writer's investigations, extending over the period from December, 1927 to August, 1928, on the factors influencing the slime disease (*Bacterium solanacearum*) of tobacco, tomato, and other crops in Sumatra [*R.A.M.*, viii, p. 74].

Inoculation experiments [which are fully described] on tomato seedlings in pots showed that the disease is favoured by soil humidity, the organism developing much more vigorously in the vessels of plants growing in pots, the soil of which was kept damp, than in those kept dry. In the most heavily watered pots, which showed most disease, the roots were not rotted, so that root rot is not a necessary concomitant of slime disease. *Bact. solanacearum* made little growth on agar cultures maintained in a dry state by the repeated heating of the Petri dishes. It would seem to be possible that the water requirements of the organism are such that it cannot flourish in dry soils. It was shown by experiments on tobacco and tomato that the wilting of the leaves of diseased plants is due to a shortage in the water supply to them and not, as suggested by some investigators, to protoplasmic poisoning in the leaf cells, with the result that their osmotic pressure is decreased. The plant reacts to the products secreted by *Bact. solanacearum* by the formation of gum in the vessels, the walls of which also show a yellowish-brown discoloration. Possibly the 'physiological drought' in plants attacked by slime disease may be partially due to this action of the secreted substances on the vascular system. That the leaf cells are not permanently poisoned by the bacterial toxins was shown by the fact that diseased tobacco tops cut off and placed in liquid recovered turgescence.

The dry, brown spots occurring on one or both sides of the midrib, between the lateral veins, and scattered along the margins of affected leaves, are attributed to the action of external factors, viz., sun and wind, on foliage deprived of its natural turgidity by a deficit of water. The condition was experimentally induced when the water supply was reduced in various ways, and also when cut leaves allowed to become limp were rapidly moved or shaken to produce bruises similar to those caused by the wind to flaccid leaves. In the same way, the oval spots along the midrib

may be explained by the up and down movement of the longitudinal leaf halves in rough weather, causing friction and consequent injury of the tissues.

These observations are thought to afford some explanation of the facts that slime disease is favoured by a high ground water level, and that heavy losses in the tobacco crop are sustained during a severe drought.

TISDALE (W. B.). **The Tobacco Experiment Station.**—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1928*, pp. 99 R–103 R, 1928. [Received January, 1930.]

Field trials for resistance to black shank of tobacco [*Phytophthora nicotianae*: *R.A.M.*, viii, p. 471] were continued. The disease was unusually prevalent in Florida during the period under review, causing appreciable damage for the first time; it was favoured by the flooding of the beds during the spring rains. A very high degree of susceptibility (100 per cent.) was shown by two Bulgarian varieties and two wild ones from Central America. Twenty-five individuals of the progeny of two plants of Java cigar wrapper tobacco which escaped infection by *P. nicotianae* in 1927 were planted on diseased soil in 1928 and remained healthy throughout the season. On the whole, the results obtained in the cigar wrapper trials were very encouraging, and it appears quite possible that continued selection may lead to the development of a satisfactory commercial type. During the last two years the P_4 and 301 selections have given good yields and may ultimately replace the Big Cuba type of leaf, the popularity of which is declining.

All types of tobacco grown in the Quincy district appear to be susceptible to *Alternaria* leaf spot, which was common on bright or flue-cured tobacco and also to some extent on cigar wrapper leaf [cf. ibid., vii, p. 544]. Infection was most severe during rainy weather in fields infested with nematodes and where a heavy growth of vegetation was turned under late in the winter.

Leaf spot caused by *Phyllosticta* [*nicotiana*: ibid., vi, p. 602] was observed for the first time since 1924. On two out of the four farms affected, practically all the sand leaves and a small percentage of the next higher ones were rendered worthless for wrappers.

SCHOEVERS (T. A. C.). **Ziekten en beschadigingen van Tomaten.** [Diseases and injuries of Tomatoes.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 26, 48 pp., 4 pl., 1929.

This is a revised and amplified account of the principal tomato diseases occurring in Holland [*R.A.M.*, i, p. 361], with directions for their control and keys for the recognition of the symptoms on the fruits and other parts of the plant.

GUBA (E. F.). **Tomato leaf mold. The use of fungicides for its control in greenhouses.**—*Massachusetts Agric. Exper. Stat. Bull.* 248, 24 pp., 1 pl., 1 fig., 1929.

After a brief review of previous literature on the control of

tomato leaf mould (*Cladosporium fulvum*), the writer gives a full account accompanied by tables, of his laboratory and field experiments in Massachusetts with a number of fungicides against this disease [*R.A.M.*, viii, p. 757 *et passim*].

It was found that sulphur dust or suspensions were not toxic to the germinating spores of the fungus. Some efficacy was manifested by high concentrations of lime-sulphur (10 per cent.) and potassium sulphate (0·4 per cent.) at high temperatures (80° and 90° F.). Copper fungicides (copper sulphate and Bordeaux mixture at varying concentrations) proved effective only in the presence of moisture. Good control was given by Schacht's naphtal-schwefel, a German product consisting of a flesh-coloured powder devoid of the characteristic naphthalene odour and not wettable with water; the typical smell of naphthalene, however, is brought out by warming or in water with sodium peroxide. The constituents of this product include sulphur soluble in carbon disulphide, sulphur by oxidation with sodium peroxide, combined naphthalene, calcium oxide probably combined as hydrate and carbonate, silicon oxide, ferric oxide, and aluminium oxide. Naphthalene dust, naphthalene-lime dust (1 : 2), uspulun, and semesan (both at 0·2 per cent.), were also effective. The spores of the fungus were killed by the fumes of burning sulphur, formaldehyde, and naphthalene. Sulphuric acid was found to be toxic to the spores of *C. fulvum* at extremely low concentrations (0·02 per cent.).

The best control of infection on potted plants inoculated with spores in water was given by copper fungicides, organic mercury compounds, and vaporized sulphur. When the plants were dusted with spores, solbar was effective in a single experiment but the only consistent control was given by vaporized sulphur. This was, moreover, the sole efficient means of controlling leaf mould under commercial conditions, and the writer has devised a simple and economical method [which is briefly described] of vaporizing sulphur by means of porcelain evaporating dishes on electric hot plates [loc. cit.]. The cost of the heating equipment is low. The autumn crop should be treated weekly with vaporized sulphur from August till the middle of November, when the adoption of continuous heating renders further applications superfluous. Vaporization with sulphur is considered to be altogether superior to spraying and dusting for the control of leaf mould, the various objections attaching to both these practices being briefly outlined.

CHILDS (L.) & ZELLER (S. M.). **Observations on Armillaria root rot of orchard trees.**—*Phytopath.*, xix, 9, pp. 869–873, 1 fig., 1 plan, 1929.

The authors' observations in the Pacific Coast States indicate the presence of two distinct strains of *Armillaria mellea*, one inhabiting the roots of conifers, especially Douglas fir (*Pseudotsuga taxifolia*), and the other being prevalent in oak-cleared land [*R.A.M.*, v, p. 746 *et passim*].

In the autumn of 1920, 57 per cent. of the apple trees in an orchard in the upper Hood River Valley were observed to be encircled at the crown by a dense collar of sporophores of *A. mellea* growing from the bark of the trees at the ground line. A network

of rhizomorphs was found on all the trees examined, even those bearing no sporophores. The orchard was planted on virgin, fir-cleared soil, and the rhizomorphs were traced from the apple roots to fir snags buried in the soil up to a depth of 5 ft. This strain of the fungus appears to be purely saprophytic, as none of the trees on which it was found suffered any apparent injury during a five-year observation period. Fructifications of the fungus occurred on 69 per cent. of the trees in one or more of the seasons covered by the investigation. Many other instances illustrating the saprophytic nature of the fir strain of *A. mellea* have been observed in the Willamette Valley. Possibly the American fir strain is distinct from that reported on conifers in Europe, where considerable damage may be traced to this source [cf. ibid., vi, p. 447].

On the other hand, *A. mellea* originating in the native oak (*Quercus garyana*) causes virulent infection on orchard trees [ibid., v, p. 37]. No appreciable differences in morphological or physiological characters were revealed by comparative examinations of the sporophores from the two strains of *A. mellea*.

VOGLINO (P.). **Una cura pratica del marciume radicale del Gelso. (Nota.)** [A practical cure of root rot of Mulberry. (Note.)]—*La Difesa delle Piante*, vi, 5, pp. 1–2, 1929.

After noting the symptoms of the root rot of mulberries associated in Italy with *Armillaria mellea* in older trees and usually with *Rosellinia necatrix* in younger ones, and pointing out that the former type of disease appears closely to resemble ink disease of the chestnut (*Blepharospora* [*Phytophthora*] *cambivora*) [cf. *R.A.M.*, ix, p. 7], the author states that in 1920 five mulberry trees showing the initial symptoms of root rot were treated by digging a trench 1 m. in radius round the collar and mixing into the soil from 3 to 5 kg. of calcium cyanamide, according to the size of the tree. By 1926 the disease appeared to have been arrested, and later the trees resumed perfectly normal growth, in contrast to some adjacent, untreated trees which were quite withered.

After a personal observation of the good effects of the method recently described by Gioda [ibid., viii, p. 474] for the control of *P. cambivora* on chestnuts, the author adapted this method over a wide area in 1926 to mulberry trees showing early symptoms of root rot, laying bare the roots to a depth of 30 cm. and a radius of 50 to 80 cm., the superfluous soil being removed. Two or three years later all the treated trees had completely recovered, in marked contrast to the untreated.

NARASIMHAMURTHY (N.) & SREENIVASAYA (M.). **Contributions to the study of spike disease of Sandal (Santalum album, Linn.). Part VI. Nitrogen metabolism in healthy and spiked leaves.**—*Journ. Indian Inst. Sci.*, xii A, 10, pp. 153–163, 1 diag., 1929.

In continuation of previous investigations on the etiology of spike disease of sandal (*Santalum album*) [*R.A.M.*, viii, pp. 474, 475], it was found, by means of chemical analyses [the results of which are discussed and tabulated] that the total nitrogen content of spiked leaves is generally greater than that of healthy ones.

There is an increase in total water-soluble nitrogen, basic nitrogen, and total amino-nitrogen, with a decrease in the nitrate nitrogen of affected leaves, both in reference to their dry weight and to the total nitrogen content. The lower content of protein nitrogen, in relation to the total nitrogen, combined with the lower polypeptide nitrogen content and the increase in amino- and water-soluble nitrogen, is considered to indicate a proteoclastic degradation of proteins in the diseased leaves.

Agostini (Angela). **Cladosporiosi, causa di seccume in Ficus magnolioides Borzi.** [Cladosporiosis, a cause of wilt in *Ficus magnolioides* Borzi.]—*Riv. Pat. Veg.*, xix, 7–8, pp. 155–163, 1 fig., 1929.

In March, 1929, two *Ficus magnolioides* trees in the Botanic Gardens at Cagliari (Italy) showed a progressive withering of the leaves and young branches accompanied by a blackening and atrophy of the opening bracts. Spots edged by a dark rim and measuring 4 to 10 mm. in diameter appeared at the apex or edges of the leaves and spread towards the middle; they were yellowish-grey on the upper, and dark yellow on the under, surface where greenish-grey subepidermal (later erumpent) tufts of conidiophores developed. The young branches also withered from the tip to the base and the lateral buds were atrophied, chlorotic, and wilted. Cultures from diseased material on various [named] media gave only *Cladosporium epiphyllum*, to which the condition is attributed.

Agostini (Angela). **Un' Alternaria e la sua forma ascofora parassite dell' Erythrina crista-galli L.** [An *Alternaria* and its ascophorous form parasitic on *Erythrina crista-galli* L.]—*Riv. Pat. Veg.*, xix, 7–8, pp. 165–172, 1 fig., 1929.

In September, 1928, the author noted a grey discoloration at the tips of the leaves of three *Erythrina crista-galli* trees growing in the vicinity of Cagliari; the spots gradually spread, the affected area finally being bordered by a dark line, 2 mm. wide. Tufts of septate, dark yellow mycelium formed, together with yellowish-brown dots which appeared to be perithecia in process of formation.

When infected leaves were placed in a damp chamber the conidiophores and conidia of a species of *Alternaria* developed on the epidermis, while minute perithecia of a *Pleospora* formed in the subepidermal parenchyma, becoming erumpent in about two weeks and measuring 250 to 280 μ in diameter.

At laboratory temperature germination of the conidia and ascospores occurred in 24 hours, giving rise to a mycelium of irregularly branched, septate, hyaline, filiform hyphae, not exceeding 1 μ in diameter at first. On the fourth day the first chains of conidia formed. It is concluded that the conidial and perithecial stages belong to the same fungus, the ascophorous form of which is referred to *Pleospora erythrina* Cesati, as it differed only in the somewhat globular perithecia and in being parasitic. The conidial stage is named *Alternaria erythrinae* n. sp., a Latin diagnosis being given. The erect, occasionally curved, septate, brownish-olive conidio-

phores measured 80 to 100 by 3 to 7 μ; the olivaceous-yellow, septate or moniliform hyphae were 3 to 7 μ in diameter, while the fusoid-clavate, deciduous, pale (later slightly fuliginous) conidia, arranged in simple or branched chains, had 6 to 8 transverse, and 1 to 2 longitudinal septa, and measured 50 to 70 by 14 to 16 μ. They were narrowed towards the top to a beak, 15 to 22 μ long.

The fungus overwinters as a saprophyte on the bark of the trunk and main branches and becomes parasitic when the host renews vegetation.

Van Vloten (H.). **Brunchorstia destruens Erikss. on Scots Pine in Scotland.**—*Scottish Forestry Journ.*, xliii, 2, pp. 157–158, 1 pl., 1929.

On a recent visit to the Spey Valley the writer observed some cases of die-back in Scots pine (*Pinus sylvestris*) caused by *Brunchorstia destruens* [*B. pinea*: *R.A.M.*, viii, p. 686], which had killed a number of one- to three-year-old shoots. The dark-coloured pycnidia of the fungus were detected on or near the leaf-scars, emerging through the bark between the leaf-scars, or projecting through the epidermis on the lower part of the needles. The pycnidia contained large numbers of typical crescent-shaped, multicellular pycnospores, many of which were still attached to well-developed conidiophores. This is stated to be the first record of *B. pinea* on *P. sylvestris* in Great Britain.

Hubert (E. E.). **Sap stains of wood and their prevention.**—Pamphlet issued by *U.S. Dept. of Commerce, Wood Utilization*, Washington, viii + 77 pp., 1 frontispiece, 35 figs., 1929.

After a brief reference to the economic importance of the various stains and moulds that develop in felled timber and industrial wood in the United States, the author gives a comprehensive account of the main characters and causes of the discolorations, which are considered under two chief headings, namely, stains produced by chemical reactions in the wood, and stains produced by fungi. The organisms responsible for the latter are listed in a key for their identification by the colour of the discoloration produced, and comprise species of *Ceratostomella*, *Graphium*, *Sclerotiopsis*, *Hormodendron*, *Torula ligniperda*, *Hormiscium gelatinosum*, *Lasiosphaeria pezizula*, *Chlorosplenium aeruginosum*, *C. aeruginascens*, *Penicillium piniphilum*, *Fusarium roseum* group, *F. negundi*, and *Penicillium divaricatum* group. A discussion is also given of the effect of the stains on the properties of the wood, and considerable space is devoted to a description of the methods for their prevention by treating the timber with fungicides, by steaming, and by proper piling in timber yards. In a final section suggestions are made for the utilization of blue stained timber. An extensive bibliography is given in the form of footnotes.

Cause and prevention of blue stain in wood.—*Tech. Notes*, Forest Products Lab., Madison, Wisconsin, 225, 4 pp., 1929.

Blue stain [*Ceratostomella* spp.: see preceding abstract] in logs may be prevented by spraying the sides and ends with an anti-

septic mixture of 1 part cresylic acid to 10 parts of crude oil or paraffin. Another method is to exclude air by sinking the logs in a pond or storing them in piles under a water spray which will keep them thoroughly wet at all times; this may be supplemented by painting the ends with a mixture consisting of 100 parts by weight of hardened gloss oil, 25 of barytes, 25 of asbestine, and 10 of cresylic acid. In order to prevent the development of blue stain in sawn timber the wood should be kiln-dried while still green and immersed in a solution of sodium carbonate (8 per cent. in wet weather and 4 per cent. in dry) or sodium bicarbonate (11 and 5·5 per cent., respectively).

Nelson (R. M.) & Gravatt (G. F.). **The tannin content of dead Chestnut trees.**—*Journ. Amer. Leather Chem. Assoc.*, xxiv, 9, pp. 479–499, 3 graphs, 1 map, 1929.

The results of a large number of tannin analyses made by co-operative American chemists in the Southern Appalachians on wood from living chestnut (*Castanea dentata*) trees and on wood dead for periods from 5 to 30 years are tabulated and discussed. It was ascertained that there is no appreciable loss of tannin content in trees dead for 20 to 30 years. Trees killed by blight (*Endothia parasitica*) can, therefore, be used for the production of extract for 20 or 30 years after death or until severe decay sets in [*R.A.M.*, viii, p. 77].

It was further shown by the analysis of chestnut wood attacked by *Polyporus pilotae, P. sulphureus, P. gilvus* [ibid., vii, pp. 131, 206, 753], *Stereum rameale, S. fasciatum, Polystictus pargamenus, P. versicolor* [ibid., vii, p. 756], *Panus stipticus* [ibid., viii, p. 281], and *Trametes cinnabarina* (the two first-named causing heart rots and the remainder sap rots) that there is little or no loss of tannin through the action of these organisms.

Liese (J.). **Holzschutz durch Auslaugung?** [Protection of timber by lixiviation?]—*Forstarch., 1929*, 20, pp. 424–425, 1929.

Samples of pine wood subjected to lixiviation by protracted immersion in water were found, in the author's laboratory tests, to be no more resistant to *Coniophora cerebella* and other wood-destroying fungi [*R.A.M.*, viii, p. 281] than similar samples dried immediately after felling. After four months the original weight of the wood had declined by some 25 per cent. in consequence of fungous infection. There is thus no foundation for the claims made by Janka (*Zentralbl. für das ges. Forstw.*, 1916) and supported in *Forstarch.*, 14, 1927, in respect of the superior durability of 'float wood'.

Sowder (A. M.). **Toxicity of water-soluble extractives and relative durability of water-treated wood flour of Western Red Cedar.**—*Indus. & Engin. Chem.*, xxi, 10, pp. 981–984, 1 fig., 1929.

The unusual durability of western red cedar (*Thuja plicata*) wood was attributed by Schmitz (*Idaho Forester*, p. 6, 1922) to the presence of a toxic resin or other substance, to some mechanical

effect produced by the cell walls, or to the structure of the cellulose molecule. He found that acetone and alcohol were the best solvents for the extraction of the toxic principle.

In order to determine the toxicity of the water-soluble extractives and the relative durability of kiln-dried and unseasoned heartwood and sapwood of *T. plicata*, finely ground samples of the various woods were extracted with water and the toxicity of the various extractives tested by the Petri dish method, each being mixed with malt agar in various concentrations (10, 50, and 100 per cent.) and inoculated with fragments of a vigorous culture of *Lentinus lepideus* [*R.A.M.*, ix, p. 147]. Samples of the various water-treated wood flours were similarly inoculated. Ten days after inoculation some of the cultures planted on the higher concentrations of heartwood extract showed no growth; in certain cases these cultures recovered on transference to test-tube slants after a period of five days to three weeks, but in others no further development occurred. The fungus made some growth in wood flour from the heartwood of both seasoned and unseasoned material. A greater percentage of soluble material was obtained from the seasoned than from the unseasoned heartwoods, and the same relation in the loss percentage due to decay was maintained, except in the case of the hot seasoned heartwood. Hot water extracts and the heartwood extracts were found to be more toxic to *L. lepideus* than the sapwood and cold water extracts.

In order to determine whether any of the toxic material present in western red cedar wood is driven off through the application of heat at the temperatures used in kiln-drying, small samples of seasoned and unseasoned wood blocks were subjected to various temperatures (80·3° to 100° C.) in an electric oven for 48 hours and the vapour recovered and condensed and used for testing as before. It was found that the volatile material driven off from the higher temperature series of heartwood blocks was more toxic to the fungus than that secured at the lower ranges, though even here a retardation of growth was apparent. It was concluded that any ill effects exerted by kiln-drying temperatures in driving off the toxic volatile materials is more than counterbalanced by the accompanying arrest of fungous growth in the wood.

Appel [O.]. **Kohlkrankheiten II.** [Cabbage diseases II.]—*Deutsche Landw. Presse*, lvi, 38, p. 546, 1 col. pl., 1929.

The so-called 'Moor's head disease' of cabbage is characterized by arrested growth of the outer leaves owing to protracted drought. With the onset of damp weather the leaves are invaded by a variety of fungi, chiefly species with dark mycelia and reproductive organs, giving the cabbage heads a blackened appearance. At the same time the green inner leaves resume growth and frequently project above the discoloured outer foliage. The condition may be remedied by plentiful applications of water and by removal of the black outer leaves in order to promote the growth of the heart.

Kohlrabi is commonly attacked by *Sclerotinia libertiana* [*S. sclerotiorum*: *R.A.M.*, iv, p. 713] during wet weather following a dry spell, and the same conditions favour the development of *Asteroma brassicae* on cabbage leaves, the damage caused by which,

however, is only superficial. *Polydesmus exitiosus* [*Alternaria brassicae*: ibid., iv, p. 61] may cause an extensive discoloration of the outer leaves, beginning at the edges and gradually spreading inwards. Watering is recommended as a preventive measure.

OSTERWALDER (A.). **Kohlhernie-Bekämpfungsversuche. 3. Mitteilung.** [Experiments in the control of club-root of Cabbage. Note 3.]—*Landw. Jahrb. der Schweiz*, xliii, 6, pp. 785–810, 1 fig., 1929.

Further experiments at Wädenswil, Switzerland, in the control of club-root of cabbage (*Plasmodiophora brassicae*) [the results of which are tabulated and fully discussed: cf. *R.A.M.*, iv, p. 324] showed that four years' crop rotation is insufficient to free the soil from the parasite. In a field planted with beans from 1919 to 1922, 11 out of 111 kohlrabi [*Brassica oleracea* var. *caulo-rapa*] plants were killed by the fungus in 1923, showing that the spores had persisted in the soil since the epidemic of 1918.

The only cabbage variety found immune from club-root in these tests was the so-called Bodenkohlrabi (Gelbe and Weisse Schmalz and Apfel); the Dreienbrunnen curly kale [*B. oleracea* var. *acephala*] was fairly resistant.

Superphosphate, potash salt, and ammonium sulphate completely failed to control the disease, and hence there is no object in substituting them for stable and liquid manure. Good results were obtained in 1926, 1927, and 1928 by the application of 10 per cent. solution of washing soda to heavily infected beds before planting kohlrabi. The treatment should be given in March or April at the rate of about 9 l. per sq. m.

MURPHY (P. A.) & HUGHES (W.). **The dry rot of Swedes and Turnips caused by Phoma lingam (Tode) Desm. (Progress report.)**—*Journ. Dept. Agric.*, Dublin, xxix, 1, pp. 29–40, 1 map, 1929.

Further evidence is stated to have confirmed the original contention of the senior author that certain fungi included in Cunningham's strain I of *Phoma lingam* [*R.A.M.*, vii, pp. 70, 759] and commonly occurring on swede seed are unconnected with *P. lingam* and dry rot, the strongly parasitic New Zealand strain II being the true *P. lingam* as known in Ireland.

Evidence has, however, now been obtained that this true *P. lingam* is also present on the seeds as well as on the leaves of swedes of English origin, and that the fungus isolated from these two sources is identical in morphological characters and pathogenicity with that found on swede roots showing dry rot [cf. ibid., viii, p. 752]. The maximum percentage of infected seeds observed was 0·2. *P. lingam* can also overwinter on the remains of diseased roots in the soil and so convey infection to the new crop.

The distribution of the disease in the Irish Free State in 1926 is described and represented in a map. In that year the disease, which recurs annually, was more severe than usual, and was generally though not uniformly distributed. The proportion of affected fields varied from under 1 to about 100 per cent., with an average of 38 per cent., while the intensity of the attack in individual

fields varied from a trace to nearly 50 per cent., the average being 10 per cent. Swedes almost everywhere were more susceptible than turnips and the disease was present on all soils.

As the evidence on varietal susceptibility was, however, exceedingly conflicting, field tests [which are described and the results of which are tabulated] were conducted in 1927; these showed that when seed of twelve varieties of swedes each from the same source were divided into two lots and sown in two widely distant localities, approximately corresponding amounts of dry rot developed in each locality in nine of the varieties, whereas in the remaining three much more disease developed in one locality than in the other. This is considered to indicate that the amount of disease present in the first nine varieties probably corresponded to the amount of seed infection originally present; but in at least two of the remaining varieties observations indicated that infection in one area arose from other sources, such as manure or the soil.

Similar field tests were made in 1928, seed of six of the abovementioned varieties being sown in three widely separated localities. In one variety of seed only, Caledonian, a minute trace of *P. lingam* was found in laboratory seed tests, amounting to only one infected seed in 4,650, but this variety in each locality developed much more disease than the others (i. e. 13·8 to 58 per cent. infection as compared with only 1 to 17·5 per cent. in the remaining varieties). The uniformity shown by all the varieties other than Caledonian in the relative amount of disease present at the three centres appears to indicate that if a number of varieties are sown in different localities under similar conditions the relative proportion of disease in each variety as compared with the others remains approximately constant. It would appear that this must be due to either (1) varying amounts of seed infection, or (2) varying susceptibility, or (3) both factors combined. The much greater amount of disease on the Caledonian swedes is probably to be attributed to the seed infection, though varietal susceptibility may have been a contributing factor. It is estimated that if each of the one in 4,650 diseased seeds gave a surviving diseased seedling there would be about 137 diseased seedlings per acre, but many of these would be removed in thinning and it is not clear how so small a number could lead to severe infection. When a number of swede varieties were procured from the same source in each case in two consecutive years there was no correspondence in the relative amounts of dry rot shown by each variety in the two seasons.

Baudyš (E.). **Studium houby Rhizoctonia violacea.** [Study of the fungus *Rhizoctonia violacea*.]—*Bull. Czecho-Slovak Acad. of Agric.*, Prague, v, 8, pp. 693–697, 1929. [German summary.]

This is a preliminary report of the author's study since 1926 of *Rhizoctonia violacea* [*R. crocorum*, the perfect stage of which has been identified as *Helicobasidium purpureum*: *R.A.M.*, viii, p. 527] for the purpose of determining its specialization and the possibility of its control by soil disinfection. The work was undertaken following reports of the steadily increasing economic importance of the root rot of some major crops caused by it in Moravia,

especially on sugar and fodder beets, the losses in which, in rainy seasons, frequently amount to 20 per cent. of the plants in the field. In sugar beet the loss is still further increased by the fact that the gross weight of badly diseased roots is reduced by about one-third, and their sugar content is lowered by 5 per cent. or more.

The experiments were made on a field known to be heavily infected with a strain of *R. crocorum* which in 1925 destroyed a number of medicinal plants, including *Archangelica officinalis* and *Hyssopus officinalis*. The tests included a wide range of different species of field and vegetable crops, among which considerable damage was done by the fungus, especially to beet, carrot, and parsley; other species, e. g., cabbage, sunflower, beans, lettuce, and marsh mallow [*Althaea officinalis*], had their roots covered with the mycelium of *R. crocorum*, but did not show any signs of injury. The fungus also attacked and injured a number of weeds, including *Agropyron repens*, *Taraxacum officinale*, and *Cirsium arvense*, which were allowed to grow on the plots. No mycelium was found on some other plants, such as maize, *Poa annua*, *Festuca pratensis*, parsnip, onion, &c. The fact that the fungus developed first on carrot, which was attacked from the earliest stage of its development and was killed out within two or three weeks, leads the author to consider that the strain in the experimental plots must be referred to Eriksson's specialized form *dauci*. To this form probably also belongs the strain of *R. crocorum* which attacks sugar and fodder beets in Moravia, since greenhouse experiments showed that it is capable of attacking *Sonchus laevis*, which is known to be susceptible to the carrot strain.

Soil disinfection experiments [details of which are given] indicated that only mercury compounds are of value as soil fungicides against *R. crocorum*. The best results were obtained with germisan, uspulun coming next. It is pointed out, however, that these preparations are comparatively costly, and cannot, therefore, be economically used in general practice. Lime and formalin gave practically no control [see also below, p. 223].

Gallagher (P. H.). **Investigation into the relation of soil conditions to failures in the Beet crop 1928.**—*Journ. Dept. Agric.*, Dublin, xxix, 1, pp. 61–81, 1 graph, 8 plans, 1929.

A full account is given of investigations undertaken in October, 1928, to determine whether certain failures in the sugar beet crop in the Irish Free State could be correlated with soil conditions.

In one area in County Louth, where failures not due to disease occurred in patches, the soils were all of the same geological formation, containing limestone, sandstone, and granite detritus; these failures are attributed to the combined adverse effects on germination of climate and a coarse, open soil.

Numerous soil samples taken from localities in Louth and Kildare where patches of beet had been killed off by *Phoma betae*, though most of the crops were normal and the soils appeared everywhere to be good, cultivable loams, showed conclusively that all the diseased areas were distinctly alkaline; under Irish conditions *P. betae* is a serious danger on soils the P_H value of which is

8 or more [cf. *R.A.M.*, viii, p. 217]. In only one case were healthy beets found in a soil appreciably exceeding this reaction, and in only one case, and in the same field, were badly diseased roots found on soil of less than this P_H value. It is thought that the former instance may be due to the admixture of an exceptionally alkaline subsoil with the surface soil, and the latter to a similar admixture of acid subsoil. That the limiting soil reaction should be P_H 8 in Ireland as contrasted with P_H 7 in Switzerland [ibid., iv, p. 522] is attributed to the moister climate of the former country, *P. betae* being favoured by drought.

Soil samples taken among beets affected by *P. betae* also showed a higher calcium carbonate content than did other samples taken among healthy roots, but as values as high as P_H 8·8 for subsoil and P_H 8·5 for surface soil were obtained it is considered that there must be some soil constituent (probably magnesium carbonate) present in these localities more alkaline than calcium carbonate.

Experiments are in progress to ascertain whether *P. betae* can be controlled by treatments designed to reduce soil alkalinity to a value below P_H 8.

An examination of soil samples from various farms in Wexford, where the beets had failed partly or wholly, although no disease appeared to be present, showed that all the soils were too acid. In some places, as where, for example the P_H value was only 4·04, they approached the extreme limit of acidity likely to be found in any cultivated soil. It is concluded that under Irish conditions the farmer who attempts to grow beet in soil of P_H 5 or under, or P_H 8 or over is running serious risk. Between P_H 5·3 and P_H 7·8 there lies a safety region; the most satisfactory results are probably obtainable in soil about P_H 6·5.

Molz (E.). **Ueber die Beizbehandlung des Saatgutes, insbesondere des Rübensamens.** [On the disinfectant treatment of seed, especially Beet seed.]—*Centralbl. für Zuckerind.*, xxxvii, 39, pp. 1109–1111, 1929.

This is a useful review of some of the more important recent literature on seed disinfection, with special reference to the treatment of beet seed-clusters against root rot (*Phoma betae*, *Aphanomyces levis* and *Pythium de Baryanum*) in Germany [*R.A.M.*, viii, p. 543 and next abstracts]. The conclusion is reached that the disinfection of beet seed is well worth while, since it certainly reduces the incidence of infection to a minimum, though such striking results as those obtained with cereal crops are hardly to be anticipated.

Plaut (M.). **Rübenkrankheiten.** [Beet diseases.]—*Centralbl. für Zuckerind.*, xxxvii, 39, pp. 1113–1117, 2 figs., 1 graph, 1929.

The results of two recent experiments (February and March, 1929) in the control of root rot of beets (*Pythium*) [*de Baryanum*: see preceding abstract] are tabulated. In the first the incidence of infection was reduced from 9·8 to 0·89 per cent. by tillantin dust (0·75 per cent.), the corresponding figure for the same dust at

1 per cent. being 2·65 per cent. and for two hours' immersion in 0·25 per cent. germisan and uspulun-universal 1·37 and 1·94 per cent., respectively. In the second test tillantin dust at both concentrations gave complete control, germisan and uspulun-universal (used as above) reduced infection from 11·7 to 2·74 and 1·46 per cent., respectively, while betanal (liquid and dust) was a complete failure.

STEHLIK (V.) & NEUWIRTH (F.). **The ecology of growing Beets and its relation to plant diseases.**—*Listy Cukrovar.*, xlvii, pp. 639–644, 1929. [Abs. in *Chem. Abstracts*, xxiii, 19, p. 4765, 1929.]

The removing of the hard seed coats of beet seed-clusters has not proved effective in the control of seedling diseases [*R.A.M.*, viii, p. 478]. The main source of infection is *Pythium de Baryanum* [see preceding abstract], which is found in diseased soils and is not seed-borne; hence fungicidal seed treatments are useless in such cases. The peeling of the seed-clusters resulted in improved germination and sprouting [see next abstract], especially in the thick-shelled varieties.

STEHLIK (V.) & NEUWIRTH (F.). **The ecology of growing Beets with respect to disease.**—*Listy Cukrovar.*, xlvii, pp. 729–735, 1929. [Abs. in *Chem. Abstracts*, xxiii, 21, p. 5215, 1929.]

The retention of the germinating capacity of beets is influenced by the storage of the seed-clusters. The intensity of respiration and loss of reserve matter are determined by such factors as the water content of the seed and of the air, temperature, light, and the presence of oxygen. The intensity of respiration is accentuated by an increase in the water content of the seed. Drying to about 15 per cent. moisture is advised to maintain the seed at constant weight and germinating capacity, but is ineffective against 'blight'. Various methods of removing the hard shell forming on seed-clusters [see preceding abstract] may expedite germination to such an extent that *Phoma betae* is outdistanced. These treatments have been mistakenly credited with disinfecting power.

LEACH (J. G.). **The effect of grafting on resistance and susceptibility of Beans to Colletotrichum lindemuthianum.**—*Phytopath.*, xix, 9, pp. 875–877, 1 fig., 1929.

Continuing his investigations on the reaction of different bean (*Phaseolus vulgaris*) varieties to infection by *Colletotrichum lindemuthianum* [*R.A.M.*, iii, p. 109], the writer made some observations, at the Minnesota Agricultural Experiment Station, on the results of grafting between resistant and susceptible varieties.

Reciprocal grafts were made between the susceptible Ruby Horticultural Bush No. 21 and the resistant Large Garapata No. 20. The epicotyls were severed and a long, downward-sloping cut was made from each side, about half-way between the hypocotyl and the first pair of leaves. The scions were interchanged and loosely held in place with cotton thread, the area of union then being

painted over with melted paraffin, and the plants placed in a damp situation for further growth. Two or three weeks later the grafts (about 15 of each type) were inoculated with *C. lindemuthianum*. In no case was there any apparent modification of resistance or susceptibility by either stock or scion.

The same result was obtained when the photosynthetic activity of either scion or stock was checked by enclosure in black paper boxes for about ten days before inoculating.

BREMER (H.). **Neuere amerikanische Untersuchungen über die 'Rotzkrankheit' der Zwiebeln.** [Recent American investigations on the 'slime disease' of Onions.]—*Obst- und Gemüsebau*, lxxv, 9, p. 172, 1 fig., 1929.

The so-called 'Rotzkrankheit' [slime disease] of onions (an inappropriate name in the writer's opinion) is characterized by the drooping, crinkling, and yellow streaking of the leaves, associated with metabolic disturbances leading to a reduction of bulb and seed formation. During 1929 the disease was reported from various parts of Germany as causing 60 to 95 per cent. infection, especially in second-year stands. Attention is drawn to the similarity between these symptoms and those of yellow dwarf in Iowa [*R.A.M.*, viii, p. 350].

VERCIER (J.). **Le Rhizoctone de l'Asperge.** [The *Rhizoctonia* of Asparagus.]—*Rev. Hort.*, ci, 22, pp. 550–551, 1929.

Asparagus crops in the Yonne Valley (France) have been decimated of recent years by the attacks of *Rhizoctonia violacea* [*R. crocorum*: see above, p. 219]. The symptoms of the disease are briefly described in popular terms [cf. *R.A.M.*, vi, pp. 395, 593, 710], and growers are urged to conduct systematic experiments in its control by the following treatments, some evidence of the efficacy of which is forthcoming: (1) carbon disulphide applied late in October at the rate of 200 gm. per sq. m. followed by general liming of the soil in February (250 gm.). (2) Ten per cent. commercial formalin in late autumn at the rate of one litre per sq. m. plus 30 gm. sulphur applied in March. (3) Application of permanganate of potassium (1 gm. per sq. m.) when rain is expected. (4) Application to the soil, in October, of a thin layer of crude ammonia (80 gm. per sq. m.). (5) Incorporation with the soil, in November, of calcium disulphide (50 gm.), followed by superficial applications of copper sulphate (15 gm.) before spring ploughing. (6) Copper acetate (30 gm.) in autumn, and spring application of 200 gm. lime and 30 gm. sulphur.

WEBER (G. F.) & FOSTER (A. C.). **Diseases of Lettuce, Romaine, Escarole, and Endive.**—*Florida Agric. Exper. Stat. Bull.* 195, pp. 303–333, 18 figs., 1928. [Received January, 1930.]

For the last five years the production of lettuce (*Lactuca sativa* var. *capitata*) in Florida has been steadily declining, partly as a result of diseases in the field and subsequent decay in transit. Three other closely related plants of minor commercial importance are similarly affected, viz., romaine (*L. sativa romaina*), endive (*Cichorium endiva*), and escarole [chicory] (*C. intybus*).

Drop (*Sclerotinia sclerotiorum* and *S. minor*) [*R.A.M.*, viii, p. 607] is destructive not only on lettuce but also on a number of other common winter-grown crops, over fifty species being liable to infection. The organisms grow best at a relatively low temperature (60° to 70° F.), and the disease is therefore most prevalent after the first cool spell, which generally sets in during November.

Downy mildew (*Bremia lactucae*) [ibid., vi, p. 11] causes heavy losses in all the above-mentioned crops and also attacks a number of allied wild plants which act as centres of infection.

Lettuce is subject to several bacterial diseases [ibid., viii, p. 635] which do not affect the other crops mentioned above, viz., wilt (*Bacterium vitians*), marginal blight (*Bact. marginale*) [ibid., iv, p. 252], rot (*Bact. viridilividum*), black rot (*Bacillus lactucae*), and rosette (*Aplanobacter rhizoctonia*). Of these the disease comprehensively known as 'rot' or 'black rot' is probably more important in Florida than all the others combined; in 1924 it caused a loss of 80 per cent. of the mature plants in a ten-acre field.

A very common disease of lettuce is damping-off, associated with *S. sclerotiorum*, *Pythium de Baryanum*, *Corticum vagum* [*C. solani*], and *Botrytis cinerea*. In Florida 10 to 15 per cent. of the seedlings are destroyed annually by this largely preventable disease.

Anthracnose (*Marssonina panattoniana*) [ibid., viii, p. 754] is of no great economic importance in the field, but it causes considerable damage in transit by paving the way for secondary organisms which rapidly involve large portions of single heads.

Grey mould (*B. cinerea*) is most common on lettuce and romaine and may cause considerable loss in transit.

Bottom rot (*C. vagum*) [*C. solani*] occurs on all the hosts discussed in this paper, as well as on some 50 other plants in the State.

Tipburn [loc. cit.] and mosaic are common and occasionally important on lettuce and romaine in Florida.

C. intybus is attacked by a species of *Alternaria* which forms small circular spots on the leaf blades. The same or a closely related species of *Alternaria* is common on lettuce, which is also liable to infection by *Septoria lactucae*, *Cercospora lactucae*, and *Sclerotium rolfsii*.

Notes are given on the symptoms and control of these diseases.

Haskell (R. J.) & Archer (W. A.). **Salsify yellows.**—*Plant Disease Reporter*, xiii, 10, pp. 139–140, 1929.

Kunkel has recorded [*R.A.M.*, vi, p. 297] the successful transference of the yellows virus from aster [*Callistephus chinensis*] to salsify (*Tragopogon porrifolius*) by the leafhopper (*Cicadula sexnotata*), but the disease does not seem to have been observed by him on salsify in the field. In September, 1929, seven salsify fields in Maryland and Pennsylvania were found to be affected (up to 5 per cent.) by yellows, which occurred in all stages from a slight retardation of growth and discoloration to extreme dwarfing and the development of supernumerary, narrow, chlorotic, mis-

shapen leaves. The roots of diseased plants were correspondingly reduced. Aster plants suffering from yellows commonly occurred in the affected salsify plots. The only other record of this condition is that furnished by Chupp from Long Island, New York, in 1927.

Osterwalder (A.). **Von der Weissfäule oder Hagelkrankheit der Trauben.** [On the white rot or hail disease of Grapes.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxviii, 21, pp. 383–386, 2 figs., 1929.

Popular notes are given on the symptoms and life-history of coître or hail disease of grapes (*Coniothyrium diplodiella*), which occurs from to time to time in certain parts of German Switzerland, though not so frequently as in the French-speaking cantons [*R.A.M.*, iv, p. 140; viii, p. 482]. The sole means of control is the timely removal and destruction of infected material.

Plant diseases.—*Eighth Ann. Rept. Min. of Agric. Northern Ireland 1928–1929*, pp. 40–44, 1929.

Notes are given on investigations in progress in Northern Ireland on various diseases of plants. Among the more important subjects of study not already mentioned in this *Review* [*R.A.M.*, viii, pp. 728, 736; ix, p. 72] are potato pink rot (*Phytophthora erythroseptica*), seedling blight and browning of flax (*Colletotrichum linicolum* [*C. lini*] and *Polyspora lini*, respectively), oat smuts (*Ustilago avenae* and *U. kolleri*) and leaf spot (*Helminthosporium avenae*), and American gooseberry mildew (*Sphaerotheca mors-uvae*) [ibid., vi, p. 674].

Marchal (P.) & Foëx (E.). **Rapport phytopathologique pour l'année 1928.** [Phytopathological report for the year 1928.]—*Ann. des Épiphyties*, xiv, 6, pp. 415–470, 1928. [Received January, 1930.]

In this report, which is compiled much on the lines of the previous one [*R.A.M.*, viii, p. 150], the authors discuss the meteorological conditions that prevailed in France during 1928 and also during the preceding autumn, and give brief notes on the diseases of the chief agricultural crops which were recorded in 1928. The following items are of interest. The foot rots of cereals caused by *Ophiobolus graminis* and *Leptosphaeria herpotrichoides* were fairly common, both forms frequently occurring in the same fields. In Alsace, however, and in some other regions, *O. graminis* appears to have been less prevalent, and *L. herpotrichoides* more, than in 1927. In the region of Paris oats were often attacked by *Septoria avenae*, while *S. graminum* was severe on wheat in the department of the Gironde. It is stated that the wheat variety Ardito is sensitive to cold, a fact which is believed to predispose it to the attacks of *S. graminum*. The potato wilt associated with *Colletotrichum atramentarium* [ibid., vii, p. 391], which had almost disappeared since 1926, again broke out in 1928 in some regions of east, central, and south-west France, but to a much lesser extent than in the former epidemics. New infection foci of the potato wart disease (*Synchytrium endobioticum*) were discovered in the

departments of Ardennes and Bas-Rhin. Tobacco wildfire (*Bacterium tabacum*) was observed in several localities in the south-west and in Alsace. It is pointed out that in the latter region a disease of tobacco undoubtedly identical with wildfire was first recorded in 1880, and since very probably the American name is a translation of 'Waldes [? wildes] Feuer', under which term the disease was at that time known in Germany, it may well be that the name 'wildfire' was introduced into the United States by Alsatian or German immigrants. It was noted that hop plants with red stems exhibit a marked resistance to downy mildew (*Pseudoperonospora humuli*), and it is, therefore, advised to use cuttings from such plants in renewing hop plantations. In one locality a sudden wilting of melons was observed, following the rotting of a definite area in the stems; this disease is believed to be of bacterial origin. The ink disease of chestnuts [*Phytophthora cambivora*] again did considerable damage in the chestnut-growing regions; the extension of the infected areas is believed to have occurred during the spring, which was wet, but visible symptoms on the trees only appeared at the beginning of the dry season. The elm disease attributed to *Graphium ulmi* is stated to be prevalent over the greater part of France, but with a varying degree of severity in different localities.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1928. [Summary of reports on the work done in laboratories during 1928.]—*Ann. des Épiphyties*, xiv, 6, pp. 471–506, 1928. [Received January, 1930.]

Notes are given on the work which was done in 1928 at the different phytopathological, entomological, and agricultural research stations in France. Most of the information of mycological interest contained in these papers has been noticed in this *Review* from other sources.

Smarods (J.). **Principal diseases of cultivated plants in 1928.**—*Rept. Latvian Inst. Plant Protect. 1928–29*, pp. 2–3, 1929. [Latvian, with English summary.]

Notes are given on the chief fungous diseases affecting economic plants in Latvia during the period from 1st May, 1928 to 1st May, 1929. Amongst other diseases of serious importance were leaf spot of beets (*Cercospora beticola*) and leaf mould of tomatoes (*Cladosporium fulvum*).

Nagorny (P. I.) & Eristavi (E. M.). Краткий обзор болезней растений в Абхазии в **1928** г. [A brief survey of plant diseases in Abkhasia in 1928.]—*Publications Agric. Exper. Stat. of Abkhasia* 38, 28 pp., 4 pl., 1929. [German summary.]

In this preliminary list brief notes and descriptions are given of the diseases of cultivated plants, which were recorded during a survey made in 1928 in the central and northern districts of Abkhasia [Caucasian littoral of the Black Sea]. The diseases are arranged by their hosts, and the following are of interest. *Cercospora personata* was found, usually in association with a species of *Phyllosticta*, attacking living leaves of the groundnut. A leaf

spot of figs was found to be caused by three species of fungi, namely, *Phyllosticta sycophila* Thüm., *P. caricae* C. Massol., and *Ascochyta caricae* Rabenh., which frequently accompanied one another. In two localities olive trees were fairly severely attacked by *Gloeosporium olivarum*; the fungus parasitizes chiefly fruits approaching maturity, on which it forms depressed, sharply delimited spots, covered with bright orange-coloured acervuli; more rarely it is found also on leaves, the laminae of which wrinkle from the tips downwards and bear brown, epiphyllous spots. According to Jaczewski the disease may be controlled by spraying the trees with lime-sulphur, in preference to cupric sprays, which may have a deleterious effect on the olives. *Phoma capsicum* was rather abundant in one locality on chilli fruits, on which it formed elliptical or irregular, dirty white or grey spots, covered with numerous black pycnidia. It was usually associated with several other fungi, among which a species of *Colletotrichum* (believed to be *C. nigrum*) was the most frequent. In the neighbourhood of Soukhoum *Pinus parvifolia* was severely defoliated by *Hypoderma brachyspora*, which formed unilinear rows of black apothecia on the needles. *Phyllosticta sojaecola* formed on soybean leaves rounded or irregular, dark grey or brown spots with a narrow black margin. Tobacco wildfire (*Bacterium tabacum*) is stated to have been rather prevalent in two districts on several varieties of tobacco, particularly on the Trapezund and Samsun varieties. Ringspot of tobacco [*R.A.M.*, viii, p. 139] occasionally occurred in mixed infection with mosaic, but was mainly present on the older and larger leaves. *P. tabaci* and *P. nicotiana* were prevalent on a number of local varieties of tobacco; *P. tabaci* was the more frequent and was usually associated with other fungi, e.g., *Ascochyta nicotianae, Sphaerella tabaci, Alternaria* spp., &c. *Cercospora solanicola* formed on tobacco leaves small, rounded, pale yellow spots that, on desiccation, became white. *Ascochyta pisi* was recorded in two localities forming elongated or rounded, yellowish-brown spots with a reddish-brown margin on French bean pods. Cotton in some localities was attacked by *A. gossypii* Woronichin, which was usually found to be associated with *Colletotrichum gossypii* and *P. gossypina.*

Manns (T. F.) & Adams (J. F.). **Department of Plant Pathology.** —*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending June 30, 1929* (*Bull.* 162), pp. 53–67, 1929.

Further studies were conducted for a fourth season (with the collaboration of Dr. O. C. Boyd) on diseases transmitted on southern-grown tomatoes, a seed-source test being made in which tomato seed from various commercial sources was sown in seed-beds in Georgia and the seedlings then taken for field planting in New Jersey and Delaware. Records were kept [and are summarized in tabular form] of the amount of disease on the plants from the several sources in the seed-bed before transplanting and again at fruiting time in the fields. Disinfecting the seed by immersion in a 1 in 1,000 solution of mercuric chloride for five minutes or dusting it with organic mercury showed no control of epidemic

outbreaks of the leaf and stem blight caused by *Macrosporium* [*Alternaria*] *solani* and the nail-head spot caused by *M. tomato* [*R.A.M.*, viii, p. 534], both of which were found on plants in the seed-beds and carried on them to the fields in Delaware. Clear evidence was obtained that some tomato blights are carried in the seed.

Treatment of sweet potato beds against black rot [*Ceratostomella fimbriata*] with formaldehyde solution (1 lb. in 25 galls. water) used at the rate of one-third gall. per sq. ft. gave very clean plants, though plants from untreated soil were heavily infected.

The soy-bean seed disinfection plots showed the following diseases. Brown spot (*Septoria glycines*) [ibid., vii, p. 77], which spread from the cotyledons to the later growth and at maturity was found on the stems, petioles, and leaflets, causing three-fourths of the leaves to fall; downy mildew (*Peronospora manshurica*) and bacterial leaf spot (*Bacterium phaseoli* var. *sojense*), which were prevalent on the upper young leaf growth; a reddish-brown lesion on the stems, which was observed for the first time and determined as the anthracnose due to *Colletotrichum glycines*. Seed disinfection did not control the seed-borne foliage diseases.

The prevalence of twig cankers due to *Bact. pruni* on the Elberta and Hale varieties of peach appears to be of increasing importance in Delaware [ibid., vii, p. 76]. On seven-year-old Elberta trees heavily infected for three years the number of cankers found in 1928 up to a height of five feet from the ground averaged 35 per tree. On trees where infection had been severe for the first time during the growing season of 1928 the cankers averaged 10 per tree. Cultures from cankers on living wood gave positive results in 50 per cent. of the cases, while of those from dead twigs 33 per cent. were successful. In the wood for ½ inch above the lesions *Bact. pruni* was recovered in 62 per cent. of the isolations, and in the wood below only in 37 per cent. Zinc sulphate prevented the growth of *Bact. pruni* in dilutions up to 1 in 2,500, while equal parts of zinc sulphate and hydrated lime (4–4–50) did so in dilutions up to 1 in 1,150.

Plant pathology.—*Idaho Agric. Exper. Stat. Bull.* 164, pp. 34–37, 1929. [Abs. in *Exper. Stat. Record*, lxi, 9, pp. 838–839, 1929.]

Rugose mosaic, leaf roll, and advanced spindle tuber of potatoes are stated to have been practically eliminated at the Idaho Agricultural Experiment Station by isolation and careful roguing of the plots [*R.A.M.*, ix, p. 51]. Tuber indexing was tested for the control of mild mosaic, but seed tubers apparently free from the disease in the field developed the symptoms in the greenhouse.

Clover mildew [*Erysiphe polygoni*] was well controlled by dusting the plants with sulphur on the appearance of the disease and subsequently at appropriate intervals [ibid., viii, p. 176].

Typhula graminum [ibid., viii, p. 439; ix, p. 29] was isolated from wheat affected by a sclerotial disease, and the same or a similar organism was found on lawn grass at the Station.

Studies of the type of bean [*Phaseolus vulgaris*] mosaic resulting from infection from beets affected with curly top [ibid., viii, p. 83] showed that, while curly top mosaic disease is present

in bean fields near leafhopper [*Eutettix tenella*] breeding-areas [ibid., viii, pp. 693, 694], it is not responsible for all the losses attributed to it. Six selections of the Great Northern bean variety have maintained their freedom from ordinary mosaic. Bean plants from seed of infected plants averaged higher percentages of mosaic than those from seed which had become infected during the season of growth.

It has been found that the uredospores of stripe rust of wheat (*Puccinia glumarum*) remain viable for a longer period at a temperature of 10° C. with a humidity of 49 per cent. than at any other temperatures and humidities tested. The germination of the teleutospores was increased by freezing for three to five days.

Toro (R. A.). **Plant disease notes from the Central Andes II.**— *Phytopath.*, xix, 10, pp. 969–974, 1929.

During the past year the writer has extended his observations on the plant diseases of Colombia [*R.A.M.*, vi, p. 469].

Two different sets of symptoms on coffee appear to be represented by the vernacular name of 'llaga' (canker). The first is a dry rot of the upper surface roots and base of the trunk, accompanied in the later stages by yellow discoloration and shedding of the leaves. This type occurs chiefly on weakened coffee trees and has also been found on the stumps of old, dead *Inga* trees. The diseased areas bear mycelial strands of a fungus resembling that described by Fawcett (*Porto Rico Agric. Exper. Stat. Bull.* 17, 1915) as connected with the black type of coffee root disease in Porto Rico. In one case abundant perithecia of an unidentified species of *Rosellinia* were found in conjunction with the strands, though no direct connexion was traced [ibid., viii, p. 442].

The second form of canker, which is comparatively rare, is characterized by a greenish discoloration of the bark, which may turn soft and emit a pungent odour. Most of the specimens of this type contained a *Fusarium* mixed with bacteria, sometimes accompanied by mycelial strands of the first type. The bark usually turns black or the wood becomes exposed. In a few cases coffee roots and stems killed by this form of canker bore the perithecia of a *Nectria* agreeing with *N. coccinea* (Pers.) Fr. var. *tropica* Wr., described from coffee in Brazil [ibid., v, p. 700]. It is proposed that the variety be raised to specific rank as *N. tropica*.

Cercospora spot of coffee (*C. coffeicola*) [ibid., viii, p. 443] was found on most of the grains classed as second grade; it is most prevalent when shade is insufficient and when cultivation has been neglected.

Top rot of sugar-cane [ibid., viii, p. 666] occurred in a serious form at Bello, near Medellin, causing a loss of at least 60 per cent. of the crop. The central leaves were wilted and desiccated, the stalks stunted, and the uppermost joints affected by dry rot. Diseased stalks showed an unusual number of nodes, and root development was greatly increased. The Cavangerie variety is more resistant to this disease than the other three cultivated in Antioquia, viz., Otaheite, Rayada, and Cristalina.

Red rot [? *Colletotrichum falcatum*] caused a considerable reduction of yield in plantations where defective cultural methods were

practised. A species of *Thielaviopsis*, probably *T. paradoxa* [*Ceratostomella paradoxa*: ibid., viii, pp. 227, 467], was detected in the reddish tissues of some of the diseased plants.

Heavy damage was inflicted on the avocado crop by tar spot (*Phyllachora gratissima*) [ibid., vi, p. 470], which causes considerable defoliation. Black, conspicuous, glistening spots appear on the upper side of the leaves, with corresponding yellowish ones on the under side. The stromata are arranged in circles, sometimes separated by brownish zones.

Cauliflowers were extensively affected by black leaf spot (*Alternaria brassicae*) [ibid., vi, p. 202; viii, p. 127], which in many cases covered the whole head with a brownish-black crust; and cabbage leaves were found to be infected by *Mycosphaerella brassicicola* [loc. cit.].

Lettuces were severely attacked by a *Cercospora* agreeing with *C. lactucae* Stevenson, reported from Porto Rico, and *C. lactucae* Welles from the Philippines [ibid., iv, p. 648], both of which appear to correspond with *C. longissima* (Cug.) Sacc. (*C. longispora* Cug.). The name *C. longissima* has priority over *C. lactucae*, and should therefore be used to describe the fungus from Porto Rico, the Philippines, and Colombia.

Colletotrichum gloeosporioides [*Glomerella cingulata*] was responsible for wither-tip of the young branches and premature shedding of mango flowers and fruits [ibid., vi, p. 288].

Carnations were attacked by *Heterosporium echinulatum* [ibid., vi, p. 667], which covered the leaves with a blackish crust and imparted a broom-like appearance to the plants, due to abnormal growth of lateral branchlets.

Other diseases occasionally observed included leaf spot of [chilli] pepper (*Cercospora capsici*) [ibid., vi, p. 601]; flower-head blotch of the grass *Sporobolus berteroanus* caused by *Helminthosporium ravenelii* [ibid., vii, p. 327]; black leaf spot of papaw due to *Asperisporium caricae* (Speg.) Maubl. (also known as *C. caricae* and *Puccinopsis caricae*) [ibid., iv, p. 683]; and a heavy infection of *I. laurina* leaves by *Cephaleuros virescens* [*C. mycoidea*].

Brown (Nellie A.) & Quirk (Agnes J.). **Influence of bacteriophage on Bacterium tumefaciens, and some potential studies of filtrates.**—*Journ. Agric. Res.*, xxxix, 7, pp. 503–530, 4 pl., 1 fig., 1929.

This is a detailed account of the authors' investigation of the action exerted on pure cultures of the hop, peach, and Paris daisy strains of *Bacterium tumefaciens* by varying dilutions (from 1 in 10 to 1 in 10 billions) of filtrates obtained from the juices of normal sugar beet and castor (*Ricinus communis*) plants, of fresh tumours produced on these plants by *Bact. tumefaciens*, of normal carrots, of carrots rotted with *Bacillus carotovorus*, and also of sewage filtrate. This study was undertaken following potentiometer experiments which indicated that the P_H values of the juices of healthy plants and of the tumours developing on these plants were frequently reversed after two to five days oxidation (e.g., if the P_H of normal sugar beet juice immediately after crushing was 5·9 and that of crushed beet tumours 6·3, in two days it changed to

6·2 and 4·8, respectively). A series of preliminary experiments, in which young castor bean plants were inoculated with cultures of *Bact. tumefaciens* (hop strain) incubated with different dilutions of oxidized tumour juice from the same plant, showed that while the cultures with the lower dilutions produced more slowly developing and smaller tumours, those with the higher dilutions gave tumours that grew more rapidly and attained larger dimensions than the tumours produced by control cultures of the organism.

The results of the investigation confirmed the existence of a bacteriophage [*R.A.M.*, viii, p. 358], the presence or absence of which in poured plate cultures appeared to be correlated with the changes that occur in the P_H values of the plant filtrates or of the *Bact. tumefaciens* cultures treated with the filtrates. Thus, for instance, a culture of the organism which produced plaques when only 24 hours old had a P_H of 6·7, while a one-month-old normal culture, which gave no plaques, had a P_H of 8·2. A culture which was treated with a filtrate of *B. carotovorus* of P_H 9·6 after 24 hours' incubation had a P_H of 7·1, which changed to 6·6 (slightly more acid than the fresh normal culture) at the end of four days; this culture produced a larger number of plaques than the cultures treated with all the other filtrates tested. The filtrates at low dilutions retarded the growth of the bacterium in pure culture, and decreased or inhibited the pathogenicity of the organism, as indicated by tumour development on castor plants inoculated with such cultures; high dilutions, on the other hand, stimulated both the growth of the organism in culture and its pathogenicity. No complete lysis of the organism was observed in the course of the work, which was continued for over a year.

Experiments conducted to check the theory advanced by d'Hérelle and Peyre of the existence of a filter-passing form of *Bact. tumefaciens* [ibid., v, p. 315], which is the infective principle and which can be cultured back to the non-filter-passing form, gave negative results.

KAUFFMANN (F.). **Zur Biologie der Tumefaciensstämme.** [On the biology of the *tumefaciens* strains.]—*Zeitschr. für Krebsforsch.*, xxx, 3, pp. 290–294, 1929.

Continuing his investigations on the biology of various strains of *Bacterium tumefaciens* [*R.A.M.*, vii, p. 622], the author found that Smith's original strain possesses a high degree of virulence; about 1/1 millionth to 1/10 millionth of a loopful from a living agar culture is the minimum dose for the production of tumours in the sunflower. Such tumours were produced only by inoculation with living material of *Bact. tumefaciens* and not by the sterile culture filtrate [see preceding abstract]. Eight *tumefaciens* (T) strains, recently isolated from carcinomata in mice inoculated with the Frankfurt mouse carcinoma strain, proved incapable of inducing tumour formation in plants. So marked are the cultural and serological differences between *Bact. tumefaciens* Smith and the T strains that they must be regarded as two distinct species. In 3 out of 14 cases the bacteria were re-isolated from ten-week-old sunflower

tumours. The tumours induced in sunflowers by *Bact. tumefaciens* are considered to result from an infectious granuloma which must not be confused with the genuine neoplasms of human and animal origin.

ISRAILSKY (W.). **Vergleichende Untersuchungen über die Rasseneigentümlichkeiten des B. tumefaciens und verwandter Mikroorganismen.** [Comparative investigations on the strain peculiarities of *B. tumefaciens* and related microorganisms.] —*Centralbl. für Bakt.*, Ab. 2, lxxix, 15–22, pp. 354–370, 12 figs., 1929.

In continuation of his previous researches [*R.A.M.*, vii, p. 77], the author carried out a comparative investigation [the results of which are fully discussed and tabulated] of the morphological and biochemical properties of *B*[*acterium*] *tumefaciens*, *B*[*acillus*] *radiobacter*, and *B. radicicola* [ibid., viii, p. 429].

Lupin nodules were found to contain, besides *B. radicicola*, *B. radiobacter* and a strain designated LI_4 which may be regarded as a transitional stage in the development of *Bact. tumefaciens*. It differs from the latter in agglutination reaction, virtual or entire deficiency of pigment, and absence of pathogenicity towards beets. The bacteriophage of *Bact. tumefaciens* exercised a lytic action on cultures of LI_4. It is pointed out that the action of the bacteriophage can only serve as a supplementary criterion for the differentiation of *Bact. tumefaciens* and *B. radicicola*, and that it is of value only in the case of a positive result. A negative outcome is useless for purposes of classification, since both the plant nodules and crown gall tumours contain strains of bacteria which are resistant to bacteriophagy.

WARDLAW (C. W.). **Witch-broom in Suriname.**—*Trop. Agriculture*, vi, 12, pp. 348–349, 1929.

Owing to the ravages of witches' broom (*Marasmius perniciosus*) [*R.A.M.*, viii, p. 636] in Surinam the cacao crop was reduced from 68,660 cwt. for the five-year period ending in 1897 to only 30,650 cwt. for the corresponding period terminating in 1907. In 1906 the local banana industry was inaugurated, but when this crop failed owing to Panama disease [*Fusarium cubense*] it was replaced in 1912 by Liberian coffee, which remains the staple agricultural product. In 1915 Stahel expressed the opinion that, provided *M. perniciosus* was kept under control, cacao would still prove a useful alternative crop.

The cost of pruning amounted to about 10 Dutch cents per tree initially and 4 to 5 Dutch cents subsequently. As a result of pruning and extra care the yield of cacao per acre increased on the best properties; but a six months' drought in 1925–6 almost annihilated the industry, the total yield falling to 204,900 kg. [about 4,033 cwt.] in 1928.

The author recently inspected some of the few remaining cacao fields; no pruning had been practised, and the amount of witches' broom present was astonishing.

Teterevnikova-Babajan (Mme D. N.). **Biologische Arten von Puccinia graminis Pers. in Nordwestrussland.** [Biological strains of *Puccinia graminis* Pers. in north-west Russia.]—*Phytopath. Zeitschr.*, i, 4, pp. 457–463, 1929.

This is the German version of a paper on the biological strains of *Puccinia graminis* in north-west Russia which has already been noticed from another source [*R.A.M.*, viii, p. 764].

Stakman (E. C.), Levine (M. N.), & Wallace (J. M.). **The value of physiologic-form surveys in the study of the epidemiology of stem rust.**—*Phytopath.*, xix, 10, pp. 951–959, 2 diags., 1929.

This is a preliminary account of the surveys conducted in the Mississippi Valley in 1926, 1927, and 1928 to ascertain the relative prevalence of the various physiological forms of stem rust of wheat (*Puccinia graminis*) in relation to the epidemiology of this disease [*R.A.M.*, ix, p. 97].

Forms 11 and 39 were fairly common in Texas in 1926, especially the former, but did not occur in any of the spring wheat States of the upper Mississippi Valley, where 18 and 36 were most frequently observed. It is very improbable that much rust was blown northward during this season, as form 11 is a virulent parasite of the hard spring and durum wheats, which would almost certainly have been widely attacked if the fungus had reached the more northerly regions.

In 1927 forms 18 and 21 were the most extensively distributed from Texas northwards, and it is probable that the rust epidemic in the north was at least partially due to wind-blown infection.

In 1927–8, according to unpublished studies made by Wallace Butler, uredospores of *P. graminis* failed to survive the winter in abundance even in the San Antonio district of Texas. Moreover, the nature of the primary infection in Texas indicated that the rust had been blown from further south. Collections were therefore made in Mexico, where 39 out of 61 samples tested proved to be form 38, while form 23 occurred in 3 cases. The former was quite prevalent in Texas and Oklahoma and was also observed a few times further north, while the latter was not found at all in the north. Form 38 may well have been blown northwards from Mexico in 1928, but in view of the relatively weak parasitism of this strain on the hard spring wheats, the occurrence of an epidemic was unlikely even had weather conditions been exceptionally favourable. The absence of severe infection in 1928 may, therefore, be partly due to the paucity of effective inoculum from the south, and in part to unfavourable meteorological conditions for rust development in the north.

These results indicate that an annual survey of the incidence of stem rust in Mexico and Texas (where the uredo stage will constitute the sole important source of infection for the northern States after the eradication of the barberries has been completed) may be of considerable assistance in forecasting the occurrence of epidemics.

Abbot (E. V.). **Stem rust of Wheat in Peru.**—*Phytopath.*, xix, 11, pp. 1041–1043, 1929.

Wheat in many of the mountain valleys of Peru is attacked every year in epidemic form by stem rust (*Puccinia graminis*), while on the coast the cultivation of this crop has been abandoned owing to the disease.

During 1928 60 varieties of wheat were imported and grown at the Lima Experiment Station in the hope of finding a rust-resistant strain. The first planting was made in the middle of June (the beginning of the Peruvian winter season) and a second in August. No rain falls on the coast of Peru and the crop was therefore irrigated.

The results obtained with 11 of the imported varieties, which are stated to be representative of the 60 tested, are tabulated and briefly discussed. The early planting of Pusa-4 showed the lowest percentage of infection among the common wheats and matured normal grain, but the second planting rusted so heavily that not a single kernel ripened, indicating that its escape in the former sowing was due to earliness rather than to inherent resistance. The early planting of Khapli emmer showed 50 per cent. infection, while in the late crop the rust amounted to 100 per cent. Except for this high degree of infection of Khapli the Peruvian form of *P. graminis* agrees with Stakman's and Levine's form 15 [*R.A.M.*, ii, p. 158], but this character suggests that it is a form previously undescribed.

Two species of barberry have been found growing along the roadsides bordering fields of rusted wheat and on the surrounding hillsides at altitudes ranging from 9,000 to 13,000 ft. above sea-level, but so far the aecidial stage of *P. graminis* has not been observed on them.

The exact mode of hibernation of *P. graminis* in Peru has not yet been determined. It seems probable, however, that the fungus may live continuously on wheat, since the crop is cultivated practically throughout the year in one or other of the mountain valleys.

Arnaud (G.). **Essais de traitement de la carie du Blé.** [Experiments in the treatment of Wheat bunt.]—*Comptes rendus Acad. d'Agric. de France*, xv, 23, pp. 844–852, 1929.

The results of a series of experiments in the control of wheat bunt [*Tilletia caries* and *T. foetens*], conducted at Versailles during 1928–9 on the susceptible Bon Fermier variety with a number of liquid fungicides and dusts, are discussed and tabulated.

In a general way, the dusts were found to be more effective on spring sown than on autumn sown wheats. Copper oxychloride was the only dust giving uniformly satisfactory results [*R.A.M.*, viii, p. 94], but its efficacy needs to be further established before it is substituted for the standard liquid treatment with 0·5 per cent. copper sulphate followed by dusting with lime, especially in the case of heavily infected seed-grain. The use of mercury compounds, which have proved useful in bunt control, is prohibited by French law on account of their great toxicity to man. Very good results were also given by one hour's immersion in a 0·5 per

cent. solution of copper fluosilicate, and by five minutes' dip in Bordeaux mixture with the addition of 50 gm. casein per hl.

The Martin and Red Hussar varieties maintained their reputation for immunity in an inoculation test, and they were almost equalled in this respect by Polish wheat (*Triticum polonicum*); Ardito and Carlotta Strampelli showed a moderate degree of resistance, while Oscar Benoist was susceptible.

Schilberszky (K.) & Urbányi (J.). **Laboratoriumsuntersuchungen zur Bewertung des kunstdüngerhaltigen Trockenbeizmittels 'Triamid'.** [Laboratory investigations for the evaluation of the synthetic fertilizer-containing disinfectant dust 'triamid'.]—*Mezögazdasági-Kutátasok*, Budapest, ii, pp. 433–438, 1929. [Abs. in *Chem. Zentralbl.*, ci (i), 5, p. 731, 1930.]

Laboratory experiments on the fungicidal properties of triamid, a preparation manufactured in Hungary, gave very satisfactory results. It is highly toxic to wheat bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*) and further stimulates the germination of the seed-grain.

Guest (E.). **Bunt disease of Wheat (and how to control it).**—*Dept. of Agric., 'Iraq, Agric. Leaflet* 19, 6 pp., 3 pl., 1929. [With Arabic translation.]

Popular notes are given on the symptoms, mode of infection, and control of wheat bunt (*Tilletia*) in 'Iraq, where considerable damage is caused by this disease. The fungus remains viable in dry soil for seven to eight years, whereas under moist conditions the spores rapidly germinate and soon die unless a fresh crop of wheat seedlings is available. This source of infection can therefore be eliminated by crop rotation, e. g. with beans [*Phaseolus* spp., &c.], cotton, maize, etc. Excellent control of bunt has been obtained at the Rustam Experiment Farm, Baghdad, by disinfection of the seed-grain with copper carbonate ($6\frac{1}{4}$ oz. per 200 lb.), using a seed-dusting machine devised by the Department of Agriculture, which can be made by any blacksmith or can be bought locally for Rs 28·8 [about £2 2*s.* 9*d.*]. The estimated cost of the treatment per acre is $2\frac{1}{2}$ annas [about $2\frac{3}{4}d.$].

Niethammer (Anneliese). **Versuche zur Deutung der stimulierenden Wirkung von Uspulun Universal beim Auflaufen des Saatgutes. II. Mitteilung. Die Stimulationskraft.** [Attempts at the interpretation of the stimulatory action of uspulun-universal on the emergence of the seed. Note II. The stimulatory capacity.]—*Zeitschr. für Pflanzenkrankh. (Pflanzenpath.) und Pflanzenschutz*, xxxix, 10–11, pp. 389–392, 1929.

Continuing her studies on the nature of the action exerted by uspulun-universal on wheat seed-grain [*R.A.M.*, viii, p. 558], the writer found that when the grain was steeped for one hour in a 0·25 per cent. solution and then dried before examination, the fungicide penetrated only through the outer coat of the grain as

far as the true seed-coats, but did not pass into the latter. The embryo was not penetrated. Experiments further showed that only an infinitesimal quantity of the disinfectant (0·0008 gm. per seed) is liberated into the soil when treated grain is sown. The examination of germinating maize seedlings in water cultures showed that dilute uspulun solutions (0·001 and 0·0001 per cent., as commonly encountered in the field when treated grain is sown) are readily absorbed by the distal parts of the roots and thence conducted to the central cylinder [ibid., viii., p. 769]. The treated plants were in no way adversely affected.

It would appear, therefore, that the direct stimulation of the seed by the penetration into it of the substances used in the disinfection process is improbable, and also that only very minute quantities of mercury can reach the seed, so that the risk of injury to health through the consumption of mercury-treated milling products is negligible.

Foëx (E.). **Le piétin du Blé en 1928–1929.** [The foot rot of Wheat in 1928–1929.]—*Comptes rendus Acad. d'Agric. de France*, xv, 29, pp. 1005–1010, 1929.

Notes are given on various types of foot rot observed on French wheat crops in 1928–9. A very serious form of the disease, known as 'white ear' or 'whitewash', was associated with the presence of a fungus which has not yet been identified and which produces discoloured ocellate spots, sometimes with a reddish border, on the sheaths, whence infection frequently passes to the stems. Cultures of this organism on nutrient agar gave a velvety, grey growth, turning brown where it reached the glass, but remaining sterile. Plants artificially inoculated on 15th September, 1929, showed the above-mentioned symptoms on 7th November, while in another plot in the same field the disease was observed on 18th November on plants from seed sown on 1st October. Probably infection also occurs naturally in the spring, since deep-seated ocellate lesions, associated in this case with the 'lodging' form of foot rot, were noticed at the end of May.

Wheat plants attacked by *Ophiobolus graminis* [*R.A.M.*, viii, p. 636] were observed from June onwards in the neighbourhood of Versailles. The stem bases were covered with a dark mycelium which sometimes penetrated to the centre of the stem and roots. The perithecia of this organism did not develop until July. In October, 1928, and from the end of March to the end of May, 1929, perithecia of *Leptosphaeria herpotrichoides* [loc. cit.] and *L. culmifraga* [ibid., ix, p. 28] were found on the lower internodes of wheat haulms that had overwintered on the surface of the soil at Épernon (Eure-et-Loir). In the same locality numerous pycnidia of *Wojnowicia graminis* [ibid., viii, p. 290] were found on the nodes (usually the second) of haulms left on the ground at the end of 1928. This organism was also isolated twice in the spring at Versailles from wheat plants with superficial brown, circular spots extending from the second towards the lower internode. The perithecia of *O. herpotrichus* were frequently observed at the end of March on overwintered haulms, but in no case was this fungus detected on living wheat plants. Both in nature and in laboratory

experiments *O. graminis* and the fungus producing the ocellate lesions were the only organisms causing appreciable injury.

FOËX (E.) & ROSELLA (E.). **Contribution à nos connaissances sur le piétin du Blé.** [Contribution to our knowledge of the foot rot of Wheat.]—*Comptes rendus Acad. des Sciences*, clxxxix, 19, pp. 777–779, 1929.

This is a somewhat condensed account of recent French investigations on foot rot of wheat, associated with *Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, an undetermined fungus producing ocellate lesions, and *Wojnowicia graminis*, a fuller version of which has been noticed from another source [see preceding abstract]. It contains the additional information, however, that the fructifications of *Cercospora herpotrichoides* were found in May on the ocellate lesions produced by the unnamed organism.

JORGENSON (L. R.). **Effect of smut infection on the yield of selfed lines and F_1 crosses in Maize.**—*Journ. Amer. Soc. Agron.*, xxi, 11, pp. 1109–1112, 1929.

The results of investigations conducted at Columbus, Ohio, in 1928 showed that the yield of selfed lines and F_1 crosses of such lines of maize was appreciably reduced by smut (*Ustilago zeae*) [*R.A.M.*, viii, p. 562]. In 50 paired comparisons of selfed lines the diseased plants yielded 39 per cent. less than the healthy, while in 366 paired comparisons in the F_1 generation the yield was reduced by 50 per cent. The greatest reduction in both groups occurred when the ears were infected, followed in the case of the selfed lines by infections below the ear, and in that of the crosses by invasion above this point.

EDDINS (A. H.). **Pathogenicity and cultural behaviour of Ustilago zeae (Beckm.) Ung. from different localities.**—*Phytopath.*, xix, 10, pp. 885–916, 3 figs., 4 diags., 1929.

The results of greenhouse and field experiments on the pathogenicity and cultural behaviour of the maize smut (*Ustilago zeae*) from different localities are fully described and tabulated [*R.A.M.*, vi, p. 224]. It was found that all the multisporidial cultures, including twelve derived from smut galls from various parts of Iowa, and five cultures isolated from one gall, differed from each other in their pathogenicity on inbred lines of maize (Four County White, Iodent, several Yellow Dents, Evergreen and Golden Bantam Sweet, and other varieties).

U. zeae is regularly heterothallic [ibid., vii, p. 372], but the production of chlamydospores by one monosporidial culture also indicates the occurrence of homothallism in the organism. When five monosporidial cultures were mated, they were found to represent four sex strains of *U. zeae*, designated A (Wisconsin 1), B (Arlington Farm 2), C (Michigan 10 and Kansas 38), and D (Arlington Farm 14) [ibid., viii, p. 376]. Paired multisporidial cultures generally proved more virulent than the individual cultures of which they were composed.

The viability of the conidia of *U. zeae* was not appreciably impaired by exposure to winter temperatures. Repeated transfer-

ence of the cultures, however, led to a complete loss of gall-forming capacity.

The hypodermic injection of the inoculum into young maize tissues produced a higher percentage of smut infection than did dropping the inoculum on the apical buds [ibid., viii, p. 562]. More smut developed on plants with open apical buds than on those with closed ones when the latter method was used.

Variations were observed in the cultural and pathogenic characters of colonies of *U. zeae* derived from 12 localities in Iowa. Colonies from the same gall, or even from the same culture, may show differences in cultural characters, and monosporidial cultures may differ as greatly as multisporidial ones.

Reichert (I.). **Note sur le Sclerotium parasite du Maïs.** [Note on the species of *Sclerotium* parasitic on Maize.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 8, pp. 230–234, 2 figs., 1929.

The author states that on finding in Palestine maize stems entirely filled with sclerotia of *Sclerotium bataticola* [*Macrophomina phaseoli*: *R.A.M.*, ix, pp. 87, 88] he critically compared this fungus with Maresquelle's description of *S. monohistum* recorded by him on maize in Morocco [ibid., iv, p. 90], and came to the conclusion that both fungi are identical and that, therefore, Maresquelle's specific name should be dropped.

Klotz (L. J.). **Red blotch and peteca of Citrus.**—*California Citrograph*, xv, 1, pp. 32–33, 2 figs., 1929.

In this note on the two important storage diseases of lemons, red blotch or adustiosis and peteca, the causes of which are as yet undetermined [see Fawcett and Lee, 'Citrus diseases and their control', p. 440, 1926], the author states that he was able to simulate the former by touching lemons with amyl formate, amyl valerate, amyl acetate, amyl propionate, and ethyl acetate, all of which have been found as products or by-products of anaerobic respiration in fruits. Red blotch effects were also secured by exposing the fruit to ethyl acetate vapour for periods ranging from 3 minutes to 2 hours. Close approximation to the albedo breakdown characteristic of peteca was obtained by injecting hypodermically small amounts of orange oil, lemon oil, and geraniol. That peteca originates internally is indicated by the fact that the outer portion of the rind over the affected albedo appears to be intact when examined under low magnifications. Both diseases are considered to be probably of physiological origin.

Briton-Jones (H. R.). **Wilt diseases of Coconut palms in Trinidad. (Part II.)**—*Trop. Agriculture*, vi, 12 (Supplement), 12 pp., 7 figs., 2 graphs, 1929.

Further evidence is adduced that the bronze leaf wilt of coco-nut palms in Trinidad [*R.A.M.*, vii, p. 716] is caused by a combination of factors including, especially, drought and unsuitable or injurious cultural practices.

Three palms, two showing 3 and one 10 bronze yellow leaves, respectively, were watered daily during the dry season. The first two recovered but the last was too far diseased at the start to do

so. Tabulated observations on a number of palms in several different estates showed that affected palms may recover sometimes for a few months only, and that such temporary recovery may recur several times, though death is inevitable in a very large number of cases. Further, a definite seasonable reduction in the incidence of the disease was correlated with the commencement of the wet season. Weeds and grasses also failed to grow under diseased trees in the dry season.

The author considers that the control of the disease is to be sought in the amelioration of the soil conditions and better cultural practices, particularly wider spacing of the trees.

CHABROLIN (C.). **La pourriture de l'inflorescence du Palmier-dattier (Khamedj).** [Rot of the inflorescence of Date Palms (Khamedj).]—*Ann. des Épiphyties*, xiv, 5, pp. 377–414, 2 pl., 6 figs., 1928. [Received January, 1930.]

This is a detailed account of the inflorescence rot or 'khamedj' of the date palm (*Phoenix dactylifera*) caused by *Mauginiella scaettae* in North Africa, a preliminary report on which was published in a previous paper [*R.A.M.*, viii, p. 565]. In addition to the information contained in the latter, it is stated that in the initial stages of the disease there may be little or no external sign that the inflorescence, still concealed within its spathe, is infected, and it is only at a later stage that the characteristic reddish spots are visible externally. At this stage the flower buds under the affected parts of the spathe may be already killed. In the early stages the mycelium only develops in the parenchymatous tissues of the spathe and, especially, in the flower buds; the hyphae, at this period, are intercellular and adpressed to the cell walls, but are not provided with haustoria. In the later stages the mycelium invades the cells, the contents of which are killed, and spreads to the vascular bundles. The mycelium that develops on the outside of the diseased organs disappears after the production of conidia.

The conidial fructifications that are formed both in nature and in pure culture consist of chains of thin-walled, hyaline cells arising on hyphae perpendicular to the surface of the substratum. The cells at first are 30 to 35 μ long; they separate from each other at the transverse septa, and then continue to subdivide further by the formation of new septa. Isolated conidia are usually one- to three-celled, rarely more; their length is very variable, and their width ranges from 5 to 12 μ (usually 7 to 9 μ). The conidia readily germinate in a decoction of the date palm inflorescence. No other forms of fructification were observed either in nature or in culture, and the new genus *Mauginiella*, proposed for the fungus by Cavara, is accepted, amended diagnoses of the genus and of *M. scaettae* being given.

A review of the existing literature on the disease showed that it is endemic and of long standing in the oases of North Africa, from Cyrenaica to Morocco, but has not yet been recorded in any other part of the world where the date palm is cultivated. Neglected trees are more frequently attacked than those that are well cared for, a fact which is attributed to the removal from the latter of diseased inflorescences, which are considered to be the only source

of infection. No difference in susceptibility has been noticed between male and female date palms. The disease does not appear to injure the general health of the trees affected by it.

The control measures recommended have already been outlined in the former paper.

STANER (P.). **Les maladies du Cotonnier dans l'Uelé.** [Cotton diseases in Uelé.]—*Bull. Agric. Congo Belge,* xx, 2, pp. 212–227, 1929.

The cotton diseases in the Uelé region of the Belgian Congo are very similar to those found at Manyema and Kivu [*R.A.M.*, ix, p. 32]. *Bacterium malvacearum* was not so abundant but *Fusarium vasinfectum* was an important cause of wilt. (?) *Nematospora gossypii* occurred in rotted bolls. Full notes are given on the control of anthracnose due to *Colletotrichum gossypii* by improved cultural and storage conditions and seed disinfection.

MITRA (M.). **Phytophthora parasitica Dast. causing 'damping off' disease of Cotton seedlings and 'fruit-rot' of Guava in India.**—*Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 249–254, 2 figs., 1929.

A morphological comparison of pure cultures of a strain of *Phytophthora*, which was found in 1926 causing a damping-off of cotton seedlings at Pusa (this being stated to be the first record of the fungus on this host in India), and of another strain causing a fruit rot of guava in Pusa, with cultures of *P. parasitica* from castor seedlings and other sources, showed that all were identical and referable to the '*microspora*' group of *P. parasitica* as emended by Ashby [*R.A.M.*, vii, p. 601]. Their identity was further proved by cross-inoculations of the three strains to each other's natural hosts and to *Sesamum* [*indicum*], since a high percentage of infection was obtained in each case.

CHIPPINDALE (H. G.). **The development in culture of Ascochyta gossypii Syd.**—*Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 201–215, 23 figs., 1929.

A detailed account is given of the author's study of the development of *Ascochyta gossypii* (originating from diseased cotton plants from North Carolina) in pure culture. Among the various media tried, Coon's modified agar [the composition of which is given] proved to be suitable for the production and study of the fruit bodies. On this medium the fungus produced, besides pycnidia and chlamydospores, large, catenulate, *Alternaria*-like resting spores, which are fully described and termed 'hypnocysts'. The pycnidia are formed by the segmentation of one to four cells in a hypha (occasionally in two and rarely in more hyphae) which gives rise to a parenchymatous mass of tissue. Both the central and ostiolar cavities in the pycnidium are formed by mucilaginous histolysis. The pycnospores are budded off the cells lining the central cavity.

The results of experiments made to test the effect of environmental conditions of the fungus showed that light did not affect either its mycelial growth or the production of the fruiting bodies.

The organism is, however, very sensitive to changes in temperature, and excess of carbon dioxide inhibited the production of pycnidia.

Taubenhaus (J. J.), Dana (B. F.), & Wolff (S. E.). **Plants susceptible or resistant to Cotton root rot and their relation to control.**—*Texas Agric. Exper. Stat. Bull.* 393, 30 pp., 5 pl., 1929. [Received February, 1930.]

The main feature of this bulletin consists in two tables, one of cultivated and the other of non-cultivated plants [arranged in the alphabetical order of their common names] which occur in the State of Texas and whose resistance or susceptibility to the cotton root rot organism (*Phymatotrichum omnivorum*) [*R.A.M.*, ix, p. 179] was studied for several years by the authors in the field and in a limited series of inoculation experiments. Altogether 518 species in both classes were found to be susceptible; among the non-cultivated plants, weeds such as the common tievine (*Ipomoea trifida*), soft groundcherry (*Physalis mollis*), and species of *Solanum* are susceptible, and are important carriers of the disease owing to their perennial nature. Distinct resistance was shown by representatives of the Geraniaceae, Verbenaceae, Allia ceae. Krameriaceae, Ranunculaceae, and Lamiaceae. As shown by a limited number of cases investigated, native vegetation in uncultivated land is subject to the disease, and is apparently responsible for outbreaks of cotton root rot in the first crop raised after breaking the land.

Taubenhaus (J. J.), Ezekiel (W. N.), & Neblette (C. B.). **Airplane photography in the study of Cotton root rot.**—*Phytopath.*, xix, 11, pp. 1025–1029, 1 fig., 1929.

It has been found almost impossible to secure photographs from the ground satisfactorily showing the relative losses caused by cotton root rot (*Phymatotrichum omnivorum*) [see preceding abstract] in fields or plots of more than a single row. This problem has been solved by aeroplane photography, which shows up the root rot patches well. Fairly sharp results may be obtained in aerial photography with a Graflex camera or with a focal-plane hand camera such as the Cycle Graphic, but for more accurate work a specially designed apparatus, e.g., the Folmer type A-1, is desirable. Ordinary films may be used in clear atmospheric conditions up to a height of 500 ft., but more reliable results are given by Eastman panchromatic films with an Aero L or Wratten K1 (light yellow) filter.

De Boissezon (P.). **Tumeur mycélienne chez 'Culex pipiens' L.** [Mycelial tumour in *Culex pipiens* L.]—*Bull. Soc. Zool. de France*. liv, pp. 297–300, 1929. [Abs. in *Bull. Inst. Pasteur*, xxvii, 24, p. 1102, 1929.]

The abdomen of a female of *Culex pipiens*, examined at Montpellier in January [? 1929], was found to contain a black, disk-shaped, mycelial tumour protruding through the wall at the third and fourth segments. Attempts to culture the fungus gave negative results, but it is believed to be a Dematiaceae on account of the yellowish, septate hyphae [cf. *R.A.M.*, viii, p. 642].

Ciferri (R.). **Sur un Grubyella parasite de Simulidés, Grubyella ochoterenai n. sp.** [Note on a species of *Grubyella* parasitic on Simulideae, *Grubyella ochoterenai* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, vii, 6, pp. 512–523, 2 figs., 1929.

A morphological, biological, and cultural account is given of a species of *Grubyella* which was found in the State of Guerrero, Mexico, on dead bodies of a few undetermined specimens of *Simulium* [dipterous flies], and cultures of which were sent to the author by I. Ochoterena. On Sabouraud's agar the fungus forms white, spongy, radiating colonies, which later assume a yellowish, woolly aspect. The mycelium is hyaline, septate, branching intricately, with hyphae 1 to 2 μ (but occasionally up to 4 μ) in diameter. The chlamydospores are intercalary, rarely pedunculate, elliptical-ovoid (11·5 by 15 μ) or rounded (10·5 μ and more in diameter). The arthrospores are usually in chains of 3 to 5, rarely 8 to 10, continuous or septate, and for the most part from 3 to 5 μ (rarely 3 to 8 μ or more) in diameter. Aleuria (which are interpreted as rudimentary chlamydospores) are few in number; they are rounded or somewhat elongated, and measure 5 μ.

Artificial infection experiments gave positive results with a few species of dipterous flies other than *Simulium*, and although nothing further is known to the author concerning infection in nature, he believes that these results authorize the hypothesis that dipterous flies may act as vectors of species of *Grubyella* pathogenic to man and animals. As the species studied by him does not agree with any other of the genus so far described [a brief review of which is given], he names it *G. ochoterenai* n. sp. ad interim.

Cordero (E. H.) & Vogelsang (E. G.). **El probable modo de infección de las mucosas por Rhinosporidium.** [The probable mode of infection of the mucosae by *Rhinosporidium*.]—*Bol. Inst. Clin. Quirúrg.*, iv, pp. 573–574, 2 figs., 1928. [Abs. in *Journ. Roy. Microscop. Soc.*, Ser. III, xlix, 3, p. 284, 1929.]

The method whereby the spores of *Rhinosporidium* reach the exterior is at present unknown. Evidence is here adduced to show that the wall of the cyst full of spores ruptures into the lumen of the glands of the nasal mucosa, the spores being thus brought to the exterior in the nasal mucus. Negative results were given by experiments in the infection of normal horses with *Rhinosporidium*. The authors believe the equine form of the disease is due to the same species as that originally detected in man [*R. seeberi*: *R.A.M.*, ix, pp. 110, 111]. Cattle are also liable to infection.

Reiss (F.). **Caractères morphologiques et biologiques de certaines espèces de Monilia.** [Morphological and biological characters of some species of *Monilia*.]—*Ann. de Parasitol. Humaine et Comp.*, vii, 6, pp. 506–510, 1 pl., 1929.

This is a brief report of the author's study of six species of *Monilia* [*Candida*: *R.A.M.*, viii, p. 677] pathogenic to man, the results of which indicate the species of this genus present definite, even if slight, differences in their morphological characters [which

are compared in a table] in liquid nutrient media. They also differ in their biochemical reactions to various kinds of sugars, which were shown to be fairly constant, independently of the age of the cultures. It is therefore considered that these reactions and the morphological differences established offer a very convenient basis for the differentiation of pathogenic species of *Candida*.

VUILLEMIN (P.). **Mycologie médicale. Mycoses de l'épiderme.** [Medical mycology. Epidermal mycoses.]—*Comptes rendus Acad. des Sciences*, lxxxix, 11, pp. 405–407, 1929.

After pointing out that the family Mycodermaceae of the Arthrosporeae includes many human and animal parasites, the author states that those which lodge in the skin produce lesions by the action either of elongated hyphae (hyphomycoses) or of short articulations (brachymycoses).

Trichophyton cruris Castellani, which causes a wet hyphomycosis, is transferred by the author to the genus *Fusoma* as *F. cruris* because the aleuria are multiseptate; *T. concentricum* R. Bl., causing the dry lesions of tokelau, is transferred to *Mycoderma* as *M. concentricum*, and *Endodermophyton roquettei* da Fonseca [*R.A.M.*, iv, p. 349], the cause of a similar affection among the native Indians of Brazil, should be known as *M. roquettei*. In the same series of dry hyphomycoses the author places a human pityriasis, the squamae of which showed the presence of numerous hyphae with close septa, measuring 3 to 6·75 μ in diameter and containing intercalary or terminal chlamydospores In cultures on solid and liquid media the appearance of the hyphae remained unchanged save that the septa were farther apart. The spores, which were often preceded by a swollen or attenuated cylindrical hyphal segment, attained a diameter of 14 μ during germination. The author names this fungus *M. dombrayi* n. sp.

Brachymycoses do not commonly cause dry lesions of the skin, but a dry, black skin disease prevalent in south China, Burma, Ceylon, Java, and Malaya is caused by a fungus formerly named *Microsporon mansoni* Castellani and later transferred to *Cladosporium* by Pinoy and to *Malassezia* by Verdun; in view of its dark, opaque, simple, irregularly distributed chlamydospores, the author considers it to be a *Torula*, and renames it *T. mansoni* (Cast.) Vuill.

Brachymycoses producing wet lesions are caused by various species of *Aleurisma*, a *Corethropsis*, and a *Mycoderma*.

The genus *Aleurisma* Link, 1809, is the type of the Aleurismeae, which with the Mycodermeae form the family of the Mycodermaceae; the aleuria are best defined by their shape and position and differ from conidia in that preparation for their disjunction does not take place simultaneously with their formation.

Achorion arloingi Busquet, found in a human eczema, is transferred to *Aleurisma* as *A. arloingi*; cultures of this fungus gave yellow aleuria and coloured bouillon and cabbage extract bright red. *A. lugdunense* Vuill., 1924, was taken from a slightly wet human lesion; on all media the squamae gave coffee-coloured cultures wherein numerous white, uninucleate aleuria measuring 3·33 to 4 by 2 to 2·25 μ rapidly developed. *A. vuilleminii*

Grigoraki, Fayot, and Magrou, taken from a lesion in the head of a dog gave similar cultures. From a small, chronically suppurating lesion in the arm of a cellarman a fungus was isolated which gave salmon-coloured cultures. When sown thickly on Sabouraud's agar the surface was smoothly papillate; when sown superficially the compact, sometimes crenulated, colonies were of a brighter colour, except for the crenellated, not very conspicuous edge. The salmon-coloured, sparse or coremial hyphae bore aleuria which were generally terminal and measured 4 by 2·3 to 10·5 by 4 μ. The author considers that this is a new species and names it *A. salmoneum*.

In the genus *Corethropsis* Corda, the sporophores, which are often fascicular, bear elongated, sterile branches. *C. hominis* Vuill., 1913, was found in a human herpes; on carrot agar at 25° C. a white down appeared, then yellowish-gold bunches which later disappeared under colourless, later greyish, tufts of spores. The aleuria were truncated at the base and measured 2·4 to 3 by 1·5 to 2·3 μ.

In 1928 Benedek isolated from 18 cases of eczema, dysidrosis, and intertrigo a fungus which he named *Schizosaccharomyces hominis*. As, however, no conjugation was observed and he mistook double-membraned chlamydospores for asci, the author considers that this name is erroneous and renames the fungus *Mycoderma hominis*.

Oguni (H.) & Hashiguchi (W.). **On the 'Trichophyton faviform album' in cattle.**—*Journ. Japanese Soc. Veter. Sci.*, viii, 3, p. 205, 1929. [Abs. in *Bull. Inst. Pasteur*, xxvii, 24, p. 1109, 1929.]

Calves at the Zootechnical Station of Nishigahara, near Tokyo, were attacked by *Trichophyton faviforme album*, which caused the development of small, scabby nodules, later giving place to round, chalky-white lesions, on the head, back, and rump. The spores of the fungus were found around the roots of the hairs which cover and conceal the spots.

Gougerot, Joyeux, Burnier, Blum (P.), Meyer (J.), & Saïdmann. **Achromies 'parasitaires' ou mieux épidermomycoses (pityriasis versicolor) achromiantes. Action décolorante, action antipigmentaire protectrice des épidermomycoses, ou mieux différence de résistance à la pigmentation.** ['Parasitic' achromia or rather achromatic epidermomycoses (pityriasis versicolor). Decolorizing action, antipigmentary protective action of the epidermomycoses, or rather difference of resistance to pigmentation.]—*Bull. Soc. Franç. de Dermatol., 1929*, 8, pp. 1028–1029, 1929.

Since the advent of sun baths, an achromatic variant of the classical form of pityriasis versicolor has become common in France. *Malassezia furfur* (with which *M. tropica* and *M. macfadenyi* are regarded as synonymous) has been isolated in all the cases examined [*R.A.M.*, vi, p. 485]. The absence of colour in the lesions is attributed to the action of the ultra-violet rays of the sun and of electric light.

CIFERRI (R.). **Sur un Acrothecium isolé du 'mal del pinto' mexicain, Acrothecium nigrum n. sp.** [A species of *Acrothecium* isolated from a case of Mexican 'mal de pinto', *Acrothecium nigrum* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, vii, 6, pp. 521-535, 3 figs., 1929.

This is a morphological and biological account of a species of *Acrothecium* which was isolated by I. Ochoterena in the State of Guerrero, Mexico, from a case of human 'mal del pinto' [*R.A.M.*, v, p. 32 ; vi, p. 31]. On Sabouraud's agar it forms dense woolly, grey to black colonies, and imparts a black colour to the substratum. The mycelium is at first hyaline, rapidly darkening and finally becoming black ; the hyphae are slender, branched, and septate. The chlamydospores are intercalar, monilioid, and form chains of varying length. The conidiophores are simple or poorly branched, almost hyaline, and denticulate. The conidia usually occur in capitules of 2 to 20 ; they are continuous or 1 to 3 septate, pear-shaped, elliptical, ovoid, or somewhat curved ; in pluriseptate conidia the central cells are of a darker colour than the terminal, while in the one-septate, both cells are almost of the same colour ; the conidia measure 16 to 30 by 6 to 11 μ (usually 22 to 26 by 8 to 9 μ).

In discussing the systematic position and affinities of the fungus, which is named *A. nigrum* n. sp. ad interim, the author states that it may be closely related to, or even identical with, *Montoyella nigra* Cast., although lack of material did not allow him of making a full comparison of the two organisms.

PUESTOW (K. L.). **Maduromycosis. A contribution of the study of maduromycosis, with report of a case of infection with Aspergillus nidulans.**—*Arch. of Dermatology*, xx, 5, pp. 642–664, 14 figs., 1929.

After reviewing the previous literature on maduromycosis since 1842, the writer gives full clinical details of a case of this disease associated with *Aspergillus nidulans* [*R.A.M.*, vii, p. 633] in a 19-year-old American girl. The condition was characterized by the development of multiple subcutaneous lesions, containing black grains, on the face, behind the right ear, and on the extensor surface of the right forearm. After numerous recurrences of infection the disease, which extended altogether over a period of six years, was finally cured by excision of the invaded tissues. Inoculation experiments on animals gave negative results. This is stated to be only the second record of *A. nidulans* as an agent of maduromycosis, and the first report of its clinical occurrence with the characteristic black grains.

ESCOMEL (E.). **Acerca de dos casos de esporotricosis faringea en Arequipa, Peru.** [Concerning two cases of pharyngeal sporotrichosis at Arequipa, Peru.]—*Bol. Inst. Clin. Quirúrg.*, iv, p. 520, 1928. [Abs. in *Bull. Inst. Pasteur*, xxvii, 24, p. 1110, 1929.]

Notes are given on two cases of pharyngeal sporotrichosis observed at Arequipa, Peru—one in a woman and the other in a 12-year-old girl. The causal organism, *Sporotrichum beurmanni*

[*R.A.M.*, ix, p. 109], which was obtained in pure culture, appears to have been ingested directly with maize grains. Cures were effected by the administration of iodide and cauterization of the diseased areas.

QUIROGA (R.). **Esporotricosis per Rhinocladium beurmanni.** [Sporotrichosis due to *Rhinocladium beurmanni.*]—*Bol. Inst. Clin. Quirúrg.*, iv, pp. 523–530, 1928. [Abs. in *Bull. Inst. Pasteur*, xxvii, 24, p. 1110, 1929.]

Polymorphic lesions, consisting of scabby pustules, ulcerations, and nodules of varying size, were produced on both legs of a woman in Santa Fé (Argentine) by *Rhinocladium* [*Sporotrichum*] *beurmanni* [see preceding abstract]. A gradual cure was effected by the iodide treatment. A review of the genus *Rhinocladium* is given.

EGLITS (M.). **Some diseases of Flax and Flax seed disinfection experiments.**—*Rept. Latvian Inst. Plant Protect. 1928–29*, p. 3, 1929. [Latvian, with English summary.]

The following fungi were observed to attack flax crops in Latvia during the period from 1st May, 1928, to 1st May, 1929: *Melampsora lini* [*R.A.M.*, viii, p. 787], *Phoma exigua* [ibid., v, p. 100], *Ascochyta linicola* [ibid., ix, p. 112], *Colletotrichum lini* [ibid., viii, p. 786], *Fusarium lini* [ibid., viii, pp. 786, 787], and *Cladosporium herbarum* [ibid., ix, p. 16]. Flax seed was successfully treated in 1927 with abavit B [ibid., vi, p. 462], which increased the yield by 28·1 per cent., and in 1928 with germisan (short disinfection process) [ibid., ix, p. 168].

VAN BEYMA THOE KINGMA (F. H.). **Über eine neue Form von Botrytis cinerea, parasitisch auf Leinsamen, Botrytis cinerea forma lini, n. f.** [On a new form of *Botrytis cinerea* parasitic on Flax seed, *Botrytis cinerea* forma *lini* n. f.]—*Phytopath. Zeitschr.*, i, 4, pp. 453–456, 1929.

From samples of flax seed submitted to the Willie Commelin Scholten Laboratory, Baarn, from the Goverment Seed Testing Station at Wageningen, Holland, the writer isolated a species of *Botrytis* which was causing a heavy reduction of germination [*R.A.M.*, viii, p. 381]. The fungus appeared to be allied to *B. cinerea*, but was found to differ from the latter in certain cultural and morphological characters. The dimensions of 10,000 conidia of *B. cinerea*, isolated from about 50 different plants, were found to range from 8·44 to 11·12 by 7·01 to 9·44 μ, the quotient of length/breadth being 1·21 to 1·32, whereas the conidia of the flax fungus (200 measurements) averaged 10·5 by 8 μ and the quotient 1·31. The *Botrytis* from flax seed is further characterized by its vigorous production of citric acid on media containing finely divided carbonate of lime. The organism is regarded as a new form of *B. cinerea*, to which the name *B. cinerea* f. *lini* is given.

MAIER-BODE. **Krankheiten und Schädlinge an Chrysanthemen.** [Diseases and pests of Chrysanthemums.] — *Gartenflora*, lxxviii, 11, pp. 321–323, 1 fig., 1929.

Popular notes are given on the symptoms and control of the following chrysanthemum diseases occurring in Germany: grey

mould (*Botrytis*) [*cinerea*: *R.A.M.*, vii, p. 244]; rust (*Puccinia chrysanthemi*) [ibid., viii, p. 242], which is stated to be confined to *Chrysanthemum indicum*; *Septoria chrysanthemella* [ibid., viii, p. 175], also restricted to the last-named species; and crown gall (*Bacterium tumefaciens*), which occurs only on *C. frutescens* [ibid., vii, p. 230].

Buddin (W.) & Wakefield (Elsie M.). **The fungus causing leaf rot of the Carnation:**—*Trans. Brit. Mycol. Soc.*, xiv, 3-4, pp. 215–221, 3 figs., 1929.

In giving some details of their study of the carnation leaf rot fungus (*Pseudodiscosia dianthi*) [*R.A.M.*, vi, p. 554; vii, p. 426], the authors point out the great similitude that exists, particularly in the shape of the conidia, between this organism and the conidial, parasitic stage of *Heteropatella antirrhini* [ibid., vi, p. 230]. In the material examined by them the conidia were borne on cylindrical, frequently branched conidiophores, 3 to 4 μ in diameter, this being the only important difference from the description of the fungus given by Höstermann and Laubert. Further, a careful search on the lower, old and very rotten leaves of diseased carnation plants, and on the lower portions of still living leaves, revealed the presence on them of pycnidial fructifications of the *Heteropatella* type. The pycnidia were from 0·25 to 0·5 mm. in diameter, and the spores, when ripe, were extruded in dirty white globules. Single spore cultures raised from the *Pseudodiscosia* conidia and from the *Heteropatella* pycnidia invariably resembled one another in appearance and in behaviour, and both were proved to be pathogenic to carnations. In no case were pycnidia produced in pure cultures. For these reasons the fungus is referred to the genus *Heteropatella* and named *H. dianthi*, a Latin diagnosis of which is appended.

The *Cercosporella* stage of *H. antirrhini* is now referred by the authors to the genus *Pseudodiscosia* and is renamed *P. antirrhini*.

Metcalfe (C. R.). **The 'shab' disease of Lavender.**—*Journ. Min. Agric.*, xxxvi, 7, pp. 640–645, 2 pl., 1929.

This is a brief report of an extensive investigation of the 'shab' disease of lavender [*R.A.M.*, v, p. 278], which was carried out from 1926 to 1928 at the Cambridge University Botany School and in certain commercial lavender plantations in England. The results confirmed Brierley's conclusion that the disease is caused by *Phoma lavandulae*. The first outward system is a yellowing in May or early June of the young shoots, which wilt and die; later the disease extends downwards to the older parts, and ultimately the whole plant is killed. The fungus was shown to invade the plants either through the leaf axils on young stems or through fresh wounds, but not through old wounds. Under suitable conditions infection can occur at any time of the year, but in nature it is most frequent in the autumn and spring. The dispersion of the disease over wide areas was shown to be effected by means of small pieces of diseased stems and leaves, by the splashing of spores from plant to plant by rain, and finally by the practice of raising

cuttings from infected plants. Of all the varieties of lavender tested, only Dwarf French, which is of no value in the manufacture of perfume, and *Lavandula dentata*, grown only under glass, were found to be immune. *P. lavandulae* was found growing saprophytically on dead plants of white goosefoot (*Chenopodium album*), a common weed in most lavender plantations, and inoculations showed that the fungus from this source is fully pathogenic on lavender.

The control measures recommended are the careful removal from the plantations of all diseased plants and their débris, which should be burnt. Severely infected plantations should preferably be burnt standing *in situ*, in order to prevent the scattering of infected material over the soil; all the lavender roots should then be removed, and the crop should not be planted on the same ground for at least a year. The plantations should be kept clear of weeds, and cuttings should only be selected from healthy plants.

Briant (A. K.) & Martyn (E. B.). **A leaf spot of Arctostaphylos manzanita.**—*Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 221–225, 2 figs., 1929.

A brief account is given of a leaf spot of *Arctostaphylos manzanita* (an ornamental evergreen shrub) which was observed in 1927 at the Botany School, Cambridge. Histological examination of the diseased tissues showed that the spots were due to cork formation, associated with the presence of a fungus with conidia of the *Macrosporium* type. The leaves, petioles, and stems of young shoots were covered with a thin surface growth of hyphae, and many of the stomata were blocked with mycelium. The hyphae ramified to a certain extent under the cuticle and in the outer wall of the epidermis, but did not penetrate further into the tissues. Immediately below the portions of the leaf surface where the fungus was most abundant, the tissues were, however, stimulated to form a layer of cork, prior to which some of the epidermal and palisade cells became filled with a reddish sap pigment.

In pure culture the fungus produced perithecia of *Pleospora herbarum*, and the conidial stage is, therefore, referred to *Macrosporium sarcinula* [*R.A.M.*, iv, p. 60].

Nicolas (G.) & Aggéry (Mlle). **Heterosporium polymorphum parasite de Viburnum odoratissimum Ker.** [*Heterosporium polymorphum*, a parasite of *Viburnum odoratissimum* Ker.] —*Bull. Soc. Hist. Nat. Toulouse*, lviii, 2, pp. 139–145, 14 figs., 1929.

This account of the writers' researches on *Heterosporium polymorphum* n. sp., the recently discovered parasite of *Viburnum odoratissimum* at Toulouse [a notice of which has already appeared: *R.A.M.*, viii, p. 447], is accompanied by figures and a Latin diagnosis of the fungus.

McWhorter (F. P.). **The cold storage company vs. 'Mr. X', Gladiolus grower. The story of an important test case involving cold storage of bulbs.**—*Florists' Exchange*, lxxii, 12, pp. 11, 38, 1929.

Full particulars are given concerning a recent lawsuit in the

United States in which a grower sued a well-known storage company for alleged freezing injury to his gladiolus corms, five barrels of which were kept from the autumn of 1928 till 28th February, 1929, at a temperature round about 33° F. (minimum just below 31°). At the request of the company the writer determined the freezing-point for gladiolus corms by a series of tests, the results of which showed that this lies below 28°. An examination of the affected corms by Dr. F. Weiss showed them to be invaded by blue mould (*Penicillium gladioli*) [*R.A.M.*, viii, p. 382], the damage from which would be increased by the mode of packing (covering the barrels with burlap, thereby excluding ventilation). Judgement was given in favour of the company.

ROSELLA (E.). **Observations sur l'Ascochyta de la. Luzerne.** [Notes on the species of *Ascochyta* on Lucerne.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 8, pp. 226–229, 2 figs., 1929.

In certain regions of France lucerne fields are stated to have been frequently attacked in 1929 by *Ascochyta medicaginis* Fuck., which, in some cases, considerably reduced the stands by killing either whole plants outright or only their aerial parts. The attacked stems bore numerous pycnidia which developed either superficially or within the cortical tissues, and measured 160 by 70 μ on the average. The pycnospores were hyaline, mostly one-celled, constricted at the septum when two-celled, and measured 8 to 14·7 by 2·3 to 4·7 μ (average 11·8 by 3·8 μ). In pure cultures the fungus only produced numerous pycnidia, and no perfect stage was observed. Inoculation of lucerne seedlings (raised from disinfected seed) with *A. medicaginis* produced a typical seedling blight; broad beans [*Vicia faba*] were also successfully infected with pure cultures of the organism in the field.

The author points out the possibility that *A. medicaginis* is identical with *A. pisi*, particularly on account of the morphology of its spores.

WESTON (W. H.). **A new Sclerospora from Fiji.**—*Phytopath.*, xix, 10, pp. 961–967, 1 fig., 1929.

The examination of some diseased material of the common Fijian reed, *Erianthus maximus* var. *seemani*, collected at Suva in June, 1924, showed the presence of a *Sclerospora* which was evidently responsible for the desiccation, discoloration, and disintegration of the leaves.

The fungus, which is named *S. northi* n. sp. (with an English diagnosis), is characterized by approximately polyhedral, occasionally irregularly piriform or oblong oogonia, ranging from 40 to 70 μ in size, usually 57 to 60·9 by 51 to 56·9 μ, with an amber brown or raw sienna to argus brown (Ridgway) wall, 3 to 5 μ (occasionally up to 10 μ) in thickness, and by spherical oospores, 35 to 52 μ in diameter (mostly 39 to 46·9 μ), with a hyaline to pale amber, dense, smooth, homogeneous to indistinctly lamellate wall, 2 to 4·5 μ in thickness. Germination was not observed.

S. northi bears a more or less close resemblance to *S. sacchari* and *S. miscanthi*, the former occurring on sugar-cane and the latter on *Miscanthus japonicus*. The oogonia of both these species, however, are more nearly spherical than those of *S. northi*, and the dimensions of the oospores are also different (49 to 54·9 μ in diameter in *S. sacchari* and 47 to 48·9 μ in *S. miscanthi*).

This is the first record of the occurrence of a *Sclerospora* on *Erianthus*. At present the new species is of no economic importance, being neither seriously destructive to its wild host nor showing any tendency to pass to more valuable cultivated crops.

Iakovleff (N. A.). Корневой рак плодовых деревьев. [Crown gall of fruit trees.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 3–4, pp. 455–459, 1 graph, 1929.

The investigation briefly outlined in this paper was initiated in 1927 at the Mleyevskaya Vegetable and Orchard Experimental Station [Russia] for the special purpose of determining the effect of crown gall (*Bacterium tumefaciens*) on the general health and development of apple and pear grafts inoculated with the organism. The study is planned to last ten years and was undertaken in view of the opinion advanced by some Russian authors and supported by a number of unpublished observations from practical gardeners that crown gall not only does not injure apple and pear trees, but rather appears to stimulate their growth.

The results of the first two years of the experiment appear to support the view stated above, since in 1928 the infected grafts, as a general rule, produced as good a growth as the controls, and in some cases even outstripped the latter. It is true that in 1927 growth was somewhat depressed in the infected grafts as compared with that of the controls, but this is attributed to the fact that they had not yet had time to become established and were, therefore, in a weakened condition. This opinion was confirmed by the examination in that year of 336 grafts, out of which 154 (47 per cent.) showed a normal year's growth though they had visible crown gall lesions on their roots, 95 (28 per cent.) had produced poor aerial growth and had a diseased root system, 23 (6 per cent.) had healthy roots and a subnormal growth, and 64 (19 per cent.) were entirely healthy.

Miller (P. W.). **Studies of fire blight of Apple in Wisconsin.**—*Journ. Agric. Res.*, xxxix, 8, pp. 579–621, 13 figs., 3 graphs, 1929.

The investigation of apple fireblight (*Bacillus amylovorus*) [*R.A.M.*, ix, p. 189] reported in detail in this paper was carried out in the years 1926 to 1928, inclusive, at Gay Mills, Wisconsin, for the purpose of studying the development of the disease and its control under natural environmental conditions. A study was conducted at the same time under partly controlled conditions in the laboratory and in the greenhouse of certain stages in the life-history of the causal organism in relation to the etiology of the disease.

Field observations indicated that the limited outbreaks of fire-blight that occurred originated for the most part from local sources of infection, and appeared to be correlated to a higher degree with the amount and distribution of rainfall and suitable temperatures for infection than with insect activity. Under Wisconsin conditions *B. amylovorus* was found to overwinter in sufficient quantities in hold-over cankers and blighted twigs to supply a plentiful source of inoculum for primary infection in the spring. The cankers showing no line of demarcation between the diseased and healthy tissues were chiefly responsible for carrying the organism over the winter, while those with a definite line of delimitation around the cankered area were commonly found to be inactive. Further evidence was also obtained that the blight organism overwinters largely in the apparently healthy tissue immediately adjacent to the discoloured margin of the canker, and does not often extend to a distance of over one inch from the latter. Secondary infection appeared to be chiefly brought about by the agency of meteoric water and, to a lesser degree, by that of insects.

Laboratory and greenhouse experiments showed that, under favourable conditions, *B. amylovorus* can enter the tissues of the host through the stomata of young leaves, sepals of unopened blossoms, and on the inside of the receptacle cups of the open flowers. There was some indication that, in the initial stages of tissue invasion, the bacteria are free-swimming in the liquid in the intercellular spaces; in later stages they are embedded in a substance which stains differently from the bacteria, and which may be a product of the host tissues rather than a zoogloea, and in advanced stages they were found inside the cells. No evidence of cyst formation [cf. ibid., viii, p. 250] was found. No toxin production was demonstrated by the methods used, the suggestion being that the host cells are killed by plasmolysis following the extraction of water from the cell contents.

Although all the varieties of apple grown in Wisconsin are susceptible, evidence of relative varietal resistance was observed, preliminary studies indicating that resistance is probably due, in part at least, to the formation by the host of a corky barrier which, in some varieties, appears to be laid down very rapidly after infection. Variations in temperature within the limited range tested did not appear to have any significant influence on the expression of resistance, but variations in moisture seemed to affect resistance. There was some evidence that apple blossoms may remain susceptible to infection for at least 150 hours after pollination.

Control experiments showed that excision of blight lesions from the trees during the dormant period caused some reduction in the amount of blossom and twig infection in the following season. The control of aphids did not appear to reduce the amount of blight to any significant degree. Bordeaux mixture (3-6-50) applied at blossoming time afforded little protection from blossom blight in 1926 and 1927. Attempts to find a suitable bactericidal treatment which would inactivate such inoculum as escapes excision have so far given inconclusive results.

Novikoff-Golovaty (M. A.) О массовой гибели плодовых деревьев на Юго-Востоке в **1927** году. [Wholesale dying-off of fruit trees in the south-east in 1927.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 3–4, pp. 431–441, 1929.

A graphic picture is given of the catastrophic dying-off of fruit trees which occurred in 1927 over the whole of south-eastern Russia and some provinces of central Russia. The greatest losses occurred in apples, pears, and quinces, in numerous orchards as many as 44 to 55 (occasionally up to 98) per cent. of the trees being killed, but stone fruits suffered also fairly severely, the total losses in these being conservatively estimated at 5 per cent. The outstanding feature of the epidemic was the sudden death of the trees, which were often entirely or partially killed in a very few weeks. This frequently happened after the fruit was set and prevented it from maturing. In noting the neglected state of the vast majority of the orchards and the prevalence in them of various fungal diseases, e. g., *Sphaeropsis malorum* [*Physalospora cydoniae*: *R.A.M.*, vii, pp. 330, 787; viii, p. 16], the author believes that the real cause of the disaster is to be sought in the inclement conditions of the 1926–7 winter and spring, coupled with an exceptionally high fruit production in the preceding year which exhausted the trees, and with the fact that local growers very often propagate cuttings originating from regions where they are not adapted to the ecological conditions of south-eastern Russia. The control measures recommended by him are based on this assumption.

Balakhonoff (P. I.). Плодоводство и черный рак плодовых деревьев (**Sphaeropsis malorum Peck**) в Северо-Кавказском крае. [Orchard industry and black canker of fruit trees (*Sphaeropsis malorum* Peck) in the North Caucasus region.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 3–4, pp. 443–453, 1929.

Fruit-growing, once a prosperous and remunerative industry in North Caucasus, is stated to have declined since the great war to less than half its former importance, the deterioration still going on at an unabated pace. This deplorable state of things is mainly due to the very neglected condition of the vast majority of both State-owned and private orchards, which allows the unchecked development of insect pests and bacterial and fungal diseases to an unprecedented extent. A detailed survey in 1927 and 1928 of apple and pear orchards, which furnish the bulk of the fruit grown in the region concerned, showed that practically all the trees are more or less severely infected with the black canker organism *Sphaeropsis malorum* [*Physalospora cydoniae*: see preceding abstract], the pathogenicity of which appears to have been considerably enhanced by long years of unhampered development, since it attacks not only old, weakened trees, but also fairly young (17 to 20-year-old) plantations, a fact which has not been noted elsewhere. A further symptom of increased virulence is that a branch is frequently entirely invaded by the fungus in a few days, after which it dies rapidly; on such branches the usual black

discoloration of the cortical tissues does not develop, but the cuticle over the affected areas becomes detached and swells in the form of extensive, more or less continuous blisters. This symptom is also stated to be new.

In the author's opinion, the only way to save the fruit-growing industry in North Caucasus is the drastic eradication of all the smaller and less valuable apple and pear orchards, and their renewal with healthy plants, followed by careful cultivation and the usual control measures against fungal diseases and insect pests. The more valuable orchards may still perhaps be saved by thorough sanitation, including the removal of the more diseased trees, wider spacing, and the excision of all cankers and heavily infected limbs. Some evidence was noticed of varietal resistance in the apple to *P. cydoniae*, but the observations so far made are inconclusive and need further confirmation.

Balakhonoff (P. I.). О причине горечи при гнили Яблок. [The cause of bitterness in Apple rots.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 3–4, pp. 535–536, 1929.

The author states that isolations and inoculation experiments have shown that the bitter taste frequently detected in apples infected with *Sphaeropsis malorum* [*Physalospora cydoniae*: see preceding abstracts] is exclusively due to secondary infection with *Trichothecium roseum*, which is usually found in association with *Fusarium putrefaciens*. Even a small spot of *T. roseum* is sufficient to impart a distinct, quinine-like bitterness to the whole decayed tissue, while pure infections with *P. cydoniae*, *F. putrefaciens*, *Penicillium glaucum*, or *Monilia* [*Sclerotinia*] *fructigena* never develop a bitter taste.

Goodwin (B. G.). **Blister disease or cracking of Apples. Successful remedial measures in Nelson district.**—*New Zealand Journ. of Agric.*, xxxix, 5, pp. 305–307, 1929.

A brief description is given of a disease locally termed cracking, which is stated to be prevalent throughout New Zealand on pears and apples, and to be particularly severe on the Dunn's Favourite variety of apple [*R.A.M.*, viii, p. 49]. On one and two-year-old twigs the disease appears in the form of small, irregularly shaped, smooth blisters, which occur either singly or in groups over large and irregular areas; on older wood the blisters not uncommonly crack across, giving a rough and scabbed appearance to the bark. On trees thus affected the fruit usually russets; apples that are attacked when young develop large and unsightly cracks.

The trouble is considered to be due mainly to a debilitated condition of the trees, while the species of *Coniothecium* usually associated with it is believed to be a secondary infection. Experiments [brief details of which are given] and field observations in the Nelson district in 1929 showed that it can be efficiently controlled by a drastic pruning of the affected trees, coupled with adequate artificial manuring, three combinations of which are given, at the following rates per acre, namely, (1) 3 cwt. basic slag, 2 cwt. blood and bone, 1 cwt. muriate of potash; (2) 1½ cwt.

sulphate of ammonia, 3 cwt. blood and bone, 1 cwt. sulphate of potash; and (3) 3 cwt. fish manure and 1 cwt. muriate of potash. A schedule is also given for the application of these manures, which should be supplemented by liming, and stress is laid on the necessity of a thorough and frequent cultivation of the soil in the orchards.

Howlett (F. S.) & May (C.). **The relation of lime-sulphur sprays to the abscission of young Apples.**—*Phytopath.*, xix, 11, pp. 1001–1007, 1 fig., 1929.

An investigation was conducted at Wooster, Ohio, to determine the effect of the second after-bloom spray against scab [*Venturia inaequalis*] on the abscission of young fruits on 27-year-old Grimes Golden and Ensee apple trees when there were no visible traces of injury either on the fruit or foliage.

Each tree received an annual pre-bloom application of 5 lb. nitrate of soda. In 1927 three pre-bloom and a calyx spraying were given, while in 1928 the trees were dusted up to and including the calyx application. Liquid lime-sulphur (1 in 15, 1 in 40, and 1 in 60) was tested in 1927, while in 1928 the same preparation was used at concentrations of 1 in 60, 1 in 100, and 1 in 120, and Bordeaux mixture (2–4–50 and 1–2–50) was also given a trial. In order to eliminate food competition as a factor in the causation of abscission, the number of fruits in each cluster was reduced to two.

The results of the experiments [which are tabulated and discussed] showed that some abscission was caused by lime-sulphur at concentrations of 1 in 40 and 1 in 60, but not at 1 in 100 or above. In no case, however, was the loss of fruit from this cause sufficient to effect any appreciable reduction in the normally heavy commercial crop [cf. *R.A.M.*, v, p. 561; viii, p. 653]. The outcome of the tests with Bordeaux mixture was inconclusive in respect of abscission, but this preparation caused severe russeting and dwarfing of the fruit during the cool, damp weather following its application.

Harley (C. P.). **Relation of picking time to acetaldehyde content and core breakdown of Bartlett Pears.**—*Journ. Agric. Res.*, xxxix, 7, pp. 483–493, 3 graphs, 1929.

The investigation briefly reported in this paper was made in 1927 in the Wenatchee district of Washington, for the purpose of ascertaining the acetaldehyde content of Bartlett pears, its relation to the development of core breakdown of the fruit [*R.A.M.*, iv, p. 746] as influenced by the time of picking, and also the concentration of carbon dioxide and oxygen in the tissues of the pears [cf. ibid., ix, p. 114]. The results indicated that the age of the fruit at picking has a direct bearing on the length of the time required for the development of core breakdown in storage, the disease developing more rapidly as the pears were picked at a more advanced stage of maturity. No traces of acetaldehyde were found in pears immediately after picking, but distinct quantities developed after two days in the ripening room at 22° to 24° C. and steadily increased from that time onwards, the highest con-

centration being attained at about the time breakdown occurred. The balance of evidence indicated that the formation of acetaldehyde is favoured by the accumulation of carbon dioxide in the intercellular gases in the pear tissues, since the maximum content of carbon dioxide was usually present some time before the first visible symptoms of breakdown appeared. In general, the oxygen content decreased as the carbon dioxide increased, though occasional high percentages of both pointed to intramolecular respiration.

Scurti (F.) & Pavarino (L.). **Sopra una nuova alterazione delle Pesche refrigerate. Il male raggiante.** [On a new disturbance of Peaches held in cold storage. The radiating disease.]—*Ann. Chim. Appl.*, xix, 9, pp. 371–382, 9 col. pl., 1929.

For some months past a hitherto undescribed disturbance has been observed in S. Martino peaches (an autumn variety cultivated in the vicinity of Turin) held in cold storage at 1° C. A brown discoloration, beginning in the internal zone surrounding the endocarp, finally spreads to the cortical zone, following the course of the vascular bundles which stand out from the pale background of the tissues in the form of slender brown strands. Ultimately the tissues soften as a result of the disintegration of the vascular bundles, and when the cortical zone is reached the epidermis ruptures, giving ingress to various rotting organisms, e.g., *Rhizopus nigricans, Trichothecium, Mucor, Aspergillus, Penicillium,* and *Sclerotinia cinerea.*

This disturbance, to which the name of 'radiating disease' is tentatively applied, is believed to be caused by the premature reaction of the kernel enzymes to the low temperature. The various phases of the condition are admirably illustrated by coloured plates.

Marinucci (M.). **Note di stagione. Per l'Exoascus deformans.** [Seasonal notes. Against *Exoascus deformans.*]—*Il Coltivatore,* lxxv, 33, pp. 463–465, 1929.

To control leaf curl of peach (*Exoascus* [*Taphrina*] *deformans*) [*R.A.M.*, viii, pp. 581, 730] under Italian conditions the author recommends that the dormant trees should be sprayed, between December and February, either with a mixture of 1 to 2 kg. copper sulphate, an equal quantity of slaked lime, and 250 gm. ammonium chloride in 100 l. of water, or with a mixture of 3 kg. sulphur and 4 kg. lime boiled in 10 l. of water, and later made up to 100 l. Pantanelli uses a modified form of the latter formula consisting of 0·7 kg. quicklime and 2 kg. sulphur per 100 l. of water, to which is added 30 c.c. of denatured alcohol, this releasing a greater quantity of polysulphide, the active principle of the mixture.

Chabrolin (C.). **Notes et observations relatives aux dépérissements de l'Abricotier.** [Notes and observations on the dying-off of Apricot trees.]—*Ann. des Épiphyties,* xiv, 5, pp. 355–376, 5 pl., 1929.

After a reference to the economic importance and geographical distribution in France of the dying-off of apricot trees, the author

discusses in some detail his own observations from 1921 to 1923, inclusive, and the work done on this question by other investigators [most of which has been noticed in this *Review*: cf. viii, pp. 180, 388, 452]. He points out that not all the cases of death of the trees can be reduced to a single type of symptom-complex, but that the type which is by far the most prevalent is that locally known as apoplexy, of which he gives a detailed description. Among the many precursory symptoms, the browning of the phloem tissues of the trunk and main limbs appears to be the most constant and specific, and all cases that do not present this discoloration are probably referable to some cause distinct from that of the most prevalent disease. He further believes that the pathological alterations which are frequently found in the wood of dying trees are a secondary phenomenon rather than the cause of death, since trees exhibiting clear precursory symptoms of apoplexy, including the brown discoloration of the phloem, may often have the wood of their trunk and main branches entirely healthy in appearance. The part attributed by some investigators to *Verticillium dahliae* in the etiology of the disease needs further investigation, since the pathogenic action and some details of the biology of the organism are still obscure. In the author's opinion, this fungus is only a secondary organism, like various other fungi and insects which established themselves on weakened trees, although in some cases these organisms may determine by themselves the death of the trees.

On the whole, it is considered that the real cause of the death of apricot trees in France has not yet been definitely established, and general lines are indicated for the further study of the condition. Besides purely physiological and nutritional causes, there still exists the possibility of the disease being caused by some parasitic micro-organism which has, so far, escaped detection.

Petersons (P.). **Checking experiments against Cronartium ribicola Dietr. and Septoria ribis Desm.**— *Rept. Latvian Inst. Plant Protect. 1928–29*, pp. 5–7, 1 fig., 1929. [Latvian, with English summary.]

Of the four fungicides tested in Latvia during 1928–9 against *Cronartium ribicola* and *Septoria ribis* on currants, viz., lime-sulphur (32° Beaumé), Bordeaux mixture, Burgundy mixture, and ammoniacal copper carbonate, the first-named, applied at a strength of 1 in 50, proved most satisfactory and economical [cf. *R.A.M.*, viii, pp. 254, 584].

Stevens (N. E.) & Bain (H. F.). **Storage rots of Cranberries.**— *Phytopath.*, xix, 11, pp. 1037–1059, 1 diag., 1929.

During 1926 the writers continued their investigation of storage rots in Howes and McFarlin cranberries [*R.A.M.*, viii, p. 114]. The methods adopted were substantially identical with those of previous seasons, except that the fruit was subjected to much lower temperatures in October (45° to 62° F., compared with 60° to 70° in 1927 and 55° to 65° in 1926).

As regards the Wisconsin crop, the keeping quality of the Howes variety was less satisfactory in 1928 than in 1927, while McFarlins

also showed a deterioration in this respect. The Massachusetts crop of both varieties kept best in 1926 and least well in 1927, while for New Jersey 1927 was the worst year and 1928 the best. For any given region and season the keeping quality up to 1st January of McFarlin (a large 'fancy' variety) is only slightly inferior to the standard late Howes variety.

The only outstanding difference in the relative importance of the various rotting fungi, as compared with former years, was the prevalence of *Glomerella* [*rufomaculans* var. *vaccinii*: loc. cit.] in both varieties in the Massachusetts crop.

Shear (C. L.) & Bain (H. F.). **Life-history and pathological aspects of Godronia cassandrae Peck (Fusicoccum putrefaciens, Shear) on Cranberry.**—*Phytopath.*, xix, 11, pp. 1017–1024, 6 figs., 1929.

The pycnidial form of the fungus causing end rot of cranberries was described by the senior author in 1917 (*Journ. Agric. Res.*, xi, p. 35) as *Fusicoccum putrefaciens* [*R.A.M.*, vii, p. 184; viii, p. 452] and it was mentioned that a Discomycete was sometimes associated with the pycnidia. During 1923 the junior writer found in Oregon and Washington an abundance of mature apothecia of this Discomycete, from which 20 monospore cultures were obtained. All these cultures produced typical pycnidia of *F. putrefaciens*, and although no apothecia developed from these bodies, the evidence in favour of a genetic connexion between the two stages of the fungus is considered to be sufficiently convincing.

The apothecial stage was found to agree with *Godronia cassandrae*, originally described by Peck on dead branches of *Cassandra calyculata* and recently observed on the same host in New York State and New Jersey. Both on cranberry stems and on *C. calyculata* the apothecia range from 0·5 to 0·7 mm. in diameter, but on cranberry fruits they grow larger (0·5 to 1·8 mm., the majority exceeding 1 mm. in diameter); the asci measure 58·8 to 117 by 5 to 7·7 μ; the ascospores (which are 4 to 7-septate at maturity) measure 55 to 74 by 2 μ on *C. calyculata* and 39 to 74 by 1·5 to 3·8 μ (mostly 55 to 70 by 2 to 3 μ) on cranberry. The examination of a specimen of *Dothiopsis myrtilli* Feltg. (*Sirexcipulina myrtilli* (Oud.) Pet.) from *Vaccinium myrtilli* in Bohemia showed that this fungus is identical with *F. putrefaciens*. Petrak suggests (*Ann. Mycol.*, xxii, p. 37, 1924) that it may be the pycnidial form of *G. ericae* (Fr.) Rehm, which is, however, distinct from *G. cassandrae*.

The cranberry blossoms and fruits may be infected by insect pollinators or through the flood water frequently used in spring to protect the young growth from frost. Possibly there may be some systemic infection entering the vines through the fruit pedicels, but the considerable reduction of end rot due to spraying indicates that the blossom and surface of the fruit are the chief seats of the rot.

The causal organism of end rot makes rapid development only in berries which have been weakened by various causes. The capacity of *G. cassandrae* to grow at low temperatures is an important factor in the storage and marketing of cranberries, the late

crops of which are generally held at temperatures too low for the development of most other rots.

Graham (J. J. T.). **Report on insecticides and fungicides.**—*Journ. Assoc. Official Agric. Chemists*, Washington, D.C., xii, 2, pp. 139–140, 1929.

Very satisfactory results are stated to have been obtained by the tentative electrolytic method (*Journ. Assoc. Official Agric. Chemists*, vii, p. 261, 1924) for the determination of copper in such products as Bordeaux-Paris green and Bordeaux-calcium arsenate. The method [technical details of which are given] provides for the deposition of copper from nitric acid solution without the previous removal of arsenic, the latter being oxidized to the pentavalent condition and maintained in this state during the electrolysis by hydrogen peroxide. It is recommended that this method (the results of which agree with those obtained by the thiosulphate method) be definitely adopted by the Association of Official Agricultural Chemists.

Tilford (P. E.) & May (C.). **The effect of Bordeaux mixture on the internal temperature of Potato leaflets.**—*Phytopath.*, xix, 10, pp. 943–949, 1929.

The results [which are tabulated] of an investigation, conducted at the Ohio Agricultural Experiment Station, on the effect of copper sprays and dusts on the internal temperature of potato leaflets (as determined by a thermo-couple inserted into the midrib) showed that a slight cooling action is exerted by Bordeaux mixture (average –1·45° C. for 4–4–50 Bordeaux in sunshine) and copper-lime dust. The whiter the coating of Bordeaux, the greater is the cooling effect. Leaves sprayed with 4–6–50 Bordeaux or lime suspension were cooler than those treated with 4–4–50 Bordeaux, while copper-lime dust (20–80) produced a cooling effect similar to that of the last-named. This may possibly explain the benefit sometimes derived from the addition of extra lime to Bordeaux mixture during the hot weather of July and August. Foliage sprayed with Bordeaux plus 1 per cent. lamp black was distinctly hotter (average 2·92° C.) than untreated leaves, owing to the absorption of the light rays.

Bewley (W. F.). **The practical sterilization by heat of small quantities of soil.**—*Journ. Min. Agric.*, xxxvi, 7, pp. 623–634, 4 pl., 2 figs., 1929.

In this paper the author discusses the advantages and drawbacks presented by the methods now in use for the partial sterilization by heat of small quantities of soil, as practised by nurserymen and market gardeners [cf. *R.A.M.*, v, p. 751]. Steaming is definitely stated to be superior to baking the soil, and should be used whenever possible, as it limits the danger of over-heating, and renders the soil easier to handle in pot work. A description is given of the construction and working of several steaming and baking apparatus, among which special mention is made of the Cheadle Royal steaming apparatus, and of the Holmes' and the modified Warburton baking apparatus. Mention is also made of

the 'Sterilatum' soil steaming apparatus (Jones & Attwood, Ltd., Stourbridge), Dorey's Patent Steam Soil Sterilizer (Leale, Ltd., Guernsey), and a portable steaming apparatus recently patented by T. R. Bean, Vale, Guernsey.

Report on the Second Imperial Mycological Conference, 1929.— London, H.M. Stationary Office, 42 pp., 1929.

The following subjects (in addition to matters relating to the scope and internal organization of the Imperial Bureau of Mycology) were discussed at the Second Imperial Mycological Conference, held in London from 23rd to 28th September, 1929. (1) Root diseases of orchard and permanent plantation crops, with special reference to the relative importance of the various fungi concerned. (2) The existing organization of plant pathological (plant protection) services in various parts of the British Empire. (3) Field inspection and certification of crops as a basis for the prevention of disease. (4) Virus diseases. (5) Practical difficulties in the administration of plant protection regulations and the possibility of laying down a standard minimum requirement for preventing the importation of diseased plant material. (6) Seed-borne diseases, with special reference to standard methods of determining percentage infection, standard methods of seed treatment, and legislation governing the export and import of seeds. (7) Organization of spray services based on weather conditions. (8) Epidemiology of common and widespread diseases in cereals, including rusts and smuts. (9) Diseases developed in fruit shipped overseas, including bitter pit and storage troubles. (10) Soil-borne and soil-induced diseases (parasitic and non-parasitic) including those of cereals. (11) Witches' broom disease of cacao [*Marasmius perniciosus*]. (12) Methods of obtaining standardized proprietary disinfectants, with special reference to (*a*) coal-tar derivatives and (*b*) mercuric compounds. (13) The breeding of a commercial lime immune from wither-tip disease (*Gloeosporium limetticolum*). (14) The deterioration of produce by moulds. (15) The control of insect pests by entomogenous fungi, with special reference to island conditions. A brief summary of the discussions is preceded by a list of the resolutions adopted by the Conference.

Foister (C. E.). **The relation of weather to plant diseases.**— 50 pp., London, H.M. Stationery Office, 1929.

In this paper, presented at the Agricultural Section of the Conference of Empire Meteorologists, 1929, the writer concisely outlines the relation of weather to plant diseases caused by fungi and allied micro-organisms, and makes some suggestions on possible methods of co-operation between meteorologists and phytopathologists. The factors discussed as bearing on this relationship include temperature, moisture, atmospheric humidity and precipitation, light, and wind. Examples of contemporary work on these problems are cited under each heading, and in conclusion a general review is given of the present status of phenological research [cf. *R.A.M.*, viii, p. 327].

A bibliography of 305 titles is appended.

Linder (D. H.). **An ideal mounting medium for mycologists.**—*Science*, N.S., lxx, 1818, p. 430, 1929.

Amann's mounting medium, consisting of 20 gm. each of carbolic acid crystals, lactic acid (syrup), and distilled water, with 40 gm. of glycerine, has been used by the writer for the past three years with eminently satisfactory results. The medium almost immediately restores the turgor of the specimens and obviates plasmolysis of fresh material, especially in the higher fungi, while at the same time it acts as a killing agent. Cotton blue (0·5 per cent.) is a suitable dye for use with this medium.

Dupain (V.). **Culture du 'Pleurotus eryngii' dans les environs de La Mothe-Saint-Héray (Deux-Sèvres).** [Cultivation of *Pleurotus eryngii* in the vicinity of La Mothe-Saint-Héray (Deux-Sèvres).]—*Compte rendu 52e Session Assoc. Franç. pour l'Avancement des Sciences*, La Rochelle, pp. 379–381, 1928. [Received February, 1930.]

A further station of *Pleurotus eryngii* has been artificially created near La Mothe-Saint-Héray (Deux-Sèvres) [west of France: *R.A.M.*, viii, p. 259]. A remarkable feature of the case is the development of the mushrooms at a distance of almost 100 m. from the original place of sowing, suggesting that the zone traversed by the mycelium may be of considerable extent.

McKinney (H. H.). **Mosaic diseases in the Canary Islands, West Africa, and Gibraltar.**—*Journ. Agric. Res.*, xxxix, 8, pp. 557–578, 21 figs., 1929.

In this paper some notes are given on the various plant mosaics which were observed during the 1926–7 Allison V. Armour scientific expedition. In the Canary Islands green mosaics were found on the potato, false garlic (*Nothoscordum fragrans*), chilli (*Capsicum frutescens* [*C. annuum*] var. *grossum*), *Fuchsia magellanica gracilis*, *Psoralea bituminosa*, and *Nicotiana glauca*; three plants of the last-named species were found to be affected with a yellow mosaic, which was pure in one specimen, and mixed with green mosaic in the remaining two. In West Africa green mosaics were found on the eggplant and on tabasco pepper [*C. annuum* var. *conoides*], but on no other solanaceous plants, on cassava, and on a native cucurbit (*Physedra barteri*); yellow mosaics were observed on a nettle (*Fleurya podocarpa*), a common weed (*Asystasia coromandeliana*), *Hibiscus calycinus*, and two native curcurbits (*Momordica charantia* and *Kedrostis foetidissima*). In Gibraltar mild dark green mosaic was seen on *Nicotiana glauca*.

The fact that the yacht used on the expedition was fitted out for laboratory work and for growing plants in pots allowed of conducting some inoculation experiments on Connecticut-Havana tobacco with the viruses isolated from ten samples of mosaic collected on *N. glauca* in the Canary Islands. The results showed the existence of two types of green mosaic, namely, a light green and a mild dark green form. In every case studied, the green type of mosaic was found to be associated to a varying extent with yellow mosaic, but the balance of evidence indicated that the latter is more generally associated with the light green mosaic

than with the mild dark green form, a strain of which has apparently been isolated, free from viruses of the yellow and the light green types. A method is described by which the virus of the yellow mosaic was concentrated (by means of successive inoculations), until a strain was obtained which produced a pure yellow mosaic on Connecticut-Havana tobacco, accompanied by a general chlorosis of the old foliage. This yellow mosaic is apparently much more destructive that the green forms, since the inoculated plants were always markedly stunted, and in some cases young plants were killed.

The green mosaic of chilli in West Africa is stated to be identical in its appearance with that which occurs commonly on this host in the United States, and it was readily transmitted by the author to healthy chilli plants. Careful examination of sugar-cane plantations in all the colonies from Gambia to the Cameroons failed to reveal any mosaic in the crop. In Sierra Leone a mosaic-like mottling was observed on groundnuts, but the trouble was shown to be caused by aphids and not by a virus disease. There was no opportunity of seeing the destructive rosette disease of this crop.

Dobroscky (Irene D.). **Is the Aster yellows virus detectable in its insect vector?**—*Phytopath.*, xix, 11, pp. 1009–1015, 1 fig., 1929.

A study of smears of virus-bearing individuals of the insect vector of aster yellows, *Cicadula sexnotata* [*R.A.M.*, viii, p. 553], under dark field illumination, of gross dissections, and of paraffin sections failed to disclose any visual evidence of the presence of the virus. The mycetome, a hereditary parasitic organ the cells of which are densely packed with fungal bodies, appears to play no part in the function of virus transmission. An intensive study of the salivary glands and alimentary tract of *C. sexnotata* also yielded negative results with regard to the detection of the agent of aster yellows. No bacterium, *Rickettsia*, fungus, protozoan, or X-body was found which might be implicated in the etiology of the disease.

Nicolas (G.). **Observations sur un endophyte de Lunularia cruciata (L.) Dumortier. Ses relations avec un Pezize, Humaria nicolai R. Maire.** [Notes on an endophyte of *Lunularia cruciata* (L.) Dumortier. Its relations to a *Peziza, Humaria nicolai* R. Maire.]—*Rev. Bryologique*, N.S., ii, 1, pp. 35–40, 1 fig., 1929.

This is an expanded account of the case of association of *Humaria nicolai* with the liverwort *Lunularia cruciata* which was described by the author in a former paper [*R.A.M.*, viii, p. 456].

Tomkins (R. G.). **Studies of the growth of moulds. I.**—*Proc. Roy. Soc. London*, Ser. B., cv, B. 738, pp. 375–401, 12 graphs, 1929.

An account is given of investigations into the influence of humidity and temperature upon the germination of numerous species of moulds, of which *Alternaria citri*, *Fusarium fructi-*

genum, *Colletotrichum gloeosporioides* [*Glomerella cingulata*], and *Trichothecium roseum* are dealt with in the present paper. The results [which are tabulated, expressed graphically, and fully discussed] may be briefly summarized as follows.

When moulds are germinating on a substratum in equilibrium with the atmosphere, at any given temperature the rate of germination, whether measured by the time taken for germ-tubes to appear or by the subsequent rate of elongation of the germ-tubes, decreases with the humidity. The rate of germination varies for different fungi, is greatest at a certain optimum temperature, and diminishes as the temperature becomes farther removed from this optimum. The range of humidities over which germination is possible varies with the temperature, is greatest at the optimum, and narrows down the farther the temperature is removed from it. The rate of germination and the range of humidity permitting germination are independent of the surface if the latter provides nothing assimilable to the spores.

If the substratum contains nutrients the latent period of germination (i. e., the interval between sowing the spores and the appearance of germ-tubes) is less, the germ-tubes elongate more rapidly, and the range of humidity over which germination is possible is increased, germination also taking place at lower temperatures than when nutrients are not available; this last characteristic was well marked in *A. citri*, less so with *F. fructigenum* and *G. cingulata*, and absent in *T. roseum*.

The relation between the growth of a colony, temperature, humidity, and the presence of a nutrient resembles qualitatively that which exists in the germination of spores.

It is concluded that when any one condition is modified so as to increase the rate of growth, then its limitation by varying any of the other conditions is rendered more difficult. Hence it would follow that any condition tending to retard growth, such as the presence of fungicides or poisonous gases, would have least effect at the optimum temperature; apparently, also, if any one of the factors which influence growth rate is changed so as to lessen the rate, the resistance of the organism to the other factors is also decreased.

[A briefer account of these investigations also appears in *Dept. Sci. & Indus. Res., Rept. Food Invest. Board for the year 1928*, pp. 41–47, 1929.]

Tsen Cheng. **Recherches sur la maladie de dégénérescence (enroulement) chez Solanum tuberosum.** [Investigations on the degeneration disease (leaf roll) in *Solanum tuberosum*.]—Thèse, Fac. Sci., Paris, 111 pp., 7 pl., 7 figs., 1929. [Abs. in *L'Année Biol.*, xxxiii, 6, p. 725–726, 1929.]

Cytological studies of potato plants affected by leaf roll [*R.A.M.*, ix, p. 122] revealed a general increase in the dimensions of the cellular elements (cells, nuclei, and vacuoles), as well as in the secretory phenomena; the protein and tannoid content is higher than in healthy plants. The vacuoles of diseased plants have a higher acidity than those of healthy ones (P_H 3 compared with 6). There is an accumulation of sugars, starch, and fats in affected

individuals, and their chlorophyll is insoluble in strong alcohol. These modifications originate in the cytoplasm and not in the cell walls, the thickening of which is merely a secondary phenomenon occurring as a result of contact with the necrotic tissues. The disorganization proceeds from the young sieve-tubes to the adjacent cells and extends as far as the pericycle or even the cortex. No parasitic bodies were detected in the cells, the granular masses in the cytoplasm sometimes taken for pathogenic organisms being only accumulations of tannoids.

WERNER (H. O.). **Relation of time of roguing to the spread of spindle tuber in seed Potato plots.**—*Phytopath.*, xix, 11, pp. 1045–1049, 1 diag., 1929.

The results of three years' experiments in the control of spindle tuber of potatoes by roguing at North Platte, Nebraska [*R.A.M.*, viii, p. 735], are summarized and tabulated. The diseased Triumph tubers were interplanted in seed plots among healthy Irish Cobblers and rogued out at three-weekly intervals. Under the conditions of the test (i. e., the production of seed potatoes as an early crop under irrigation), no symptoms of spindle tuber were observed during the current season either on the plants or tubers from the experimental plots. It was apparent, however, by the high percentage of spindle tuber and the reduced yield in the following year that considerable infection had actually occurred. The roguing carried out on 10th June (7 weeks after planting) was reasonably effective, but subsequent operations were of little value. The early maturity of the plants due to drought was instrumental in preventing the spindle tuber virus from reaching the seed tubers. The presence of a slight amount of spindle tuber in Irish Cobblers was found to detract from the appearance and market value of the tubers, though it did not necessarily reduce the yield to any appreciable extent.

SEVENSTER (A.). **Plants de Pomme de terre sélectionnées de Hollande.** [Selected Potato seed from Holland.]—*Journ. d'Agric. Prat.*, xciii, 48, pp. 435–437, 1929.

In order to guard against all possibility of fraudulent dealing, French growers wishing to procure Dutch potatoes for seed should obtain their material either through the Central Committee of Crop Control (Wageningen) or the General Institute for the Control of Seed-Grain, Seed, and Seed Potatoes (Amsterdam) [see also *R.A.M.*, viii, p. 805]. Consignments of seed potatoes negotiated by these agencies are accompanied by duly authenticated health certificates and delivered in sacks with unbroken seals. On the other hand, buyers of unselected Dutch seed potatoes receive no guarantee that the material is free from degeneration or other diseases.

WIELAND. **Die Kartoffelstaudenauslese in der Grenzmark.** [Hill selection of Potatoes in the Grenzmark.]—*Illus. Landw. Zeit.*, xlix, 46, pp. 538–539, 1929.

With a view to improving the quality of the seed potatoes grown in the Grenzmark district of Germany, the local agricultural

authorities have instituted a system of mass selection in which plants affected by the following diseases are rejected: blackleg (*Bact. phyt.*) [*Bacillus phytophthorus*: *R.A.M.*, viii, p. 396], late blight (*Phytophthora infestans*), *Rhizoctonia* foot rot (*Hypochnus* [*Corticium*] *solani*), and wart disease [*Synchytrium endobioticum*]. Some details are given concerning the application of the method.

WILD (NORA). **Untersuchungen über den Pulverschorf der Kartoffelknollen (Spongospora subterranea [Wallr.] Johnson).** [Investigations on the powdery scab of Potato tubers (*Spongospora subterranea* (Wallr.) Johnson).]—*Phytopath. Zeitschr.*, i, 4, pp. 367–452, 13 figs., 3 diags., 10 graphs, 1929.

The results [which are fully described and tabulated] of the writer's field experiments in Switzerland (14 at medium altitudes and 1 near Davos in the Alps) showed that powdery scab of potatoes is invariably caused by *Spongospora subterranea* [*R.A.M.*, ii, pp. 389, 567]. The fungus was found to be capable of penetrating the tubers through lenticels and wounds of various kinds, but it is uncertain whether infection can occur on the uninjured skin. *S. subterranea* produces alterations in the cellulose of the cell walls, causing swelling; the cells enlarge and divide, mostly before they are actually invaded by the parasite. This division results in the formation of a new periderm, and may be attributed either to the stimulus exerted by a secretion of the fungus or to a wound reaction to the mechanical attack of the organism. The newly-formed periderm consists of more cell layers than the normal skin, while the single cells are somewhat narrower than usual. The entrance of the fungus into the first newly-formed peridermal layer is immediately followed by further cell divisions and the development of a second 'wound periderm'. Starch disappears below the diseased areas, being utilized either for the nutrition of the fungus or in the process of cell division.

At the time of the potato harvest, spore balls are seldom visible, especially in the case of early varieties, and the difficulty of detecting the plasmodia often leads to erroneous diagnoses. The typical symptom of powdery scab, viz., the delimitation of the pustules by a raised margin of skin, may be poorly defined, while the diagnosis is further complicated by the simultaneous occurrence of secondary parasites, especially *Rhizoctonia* [*Corticium*] *solani*, which are readily isolated from diseased tubers, while the cultivation of *S. subterranea* presents great difficulties. It is believed that many cases of powdery scab are wrongly referred to *C. solani*. The periderm underlying the sclerotia of the latter organism was in many cases observed to be normal, but occasionally the cells appeared irregular and disorganized. In no case, however, did infection by *C. solani* lead to cell division, periderm formation in the deeper tissues, or disappearance of starch.

No clear correlation could be detected, during two years' field observations, between the incidence of powdery scab and the prevalence of any particular climatic conditions. Both years, however, were favourable to the disease, judging from German and American data, as regards rainfall and temperature. The reason for the varying degree of infection in different plots under

favourable climatic conditions must, therefore, be sought in the composition and other properties of the soil. Powdery scab flourishes in soils with a large pore space, a high humus content combined with coarse texture, a high methylpentosan content, and large water-holding capacity. The incidence of infection is apparently not affected by the hydrogen-ion concentration of the soil within a range of P_H 5·9 to 7·6, or by its carbonate or hexosan content.

In general, the skin of sound tubers in fields severely infected by powdery scab was thinner and consisted of fewer cell layers than those from healthy plots, but no anatomical differences were observed between the pustules of tubers from various soils. The produce of diseased seed tubers was not, as a rule, more heavily infected than that from healthy seed in the same field, so that the disease appears either to have spread rapidly or the soil must have been infected at the beginning of the trials. Where the soil is unfavourable to the development of *S. subterranea*, the planting of scabbed tubers appears to produce no adverse effects. On the other hand, in soils containing the causal organism or favouring its development, disinfection of the seed is useless.

A comprehensive bibliography is appended.

Köhler (E.). **Die Züchtung krebsfester Kartoffelsorten.** [The breeding of wart-resistant Potato varieties.]—*Der Züchter*, 1, pp. 16–20, 1929. [Abs. in *Resumptio Genetica*, iv, 3, pp. 109–110, 1930.]

An account is given of Spieckermann's laboratory method for the testing of potatoes for immunity from wart disease [*Synchytrium endobioticum*: *R.A.M.*, iii, p. 600]. Immune varieties are considered to be obtainable only by means of seedling selection. There are believed to be no grounds for anticipating any future modifications in the pathogenic properties of the fungus, judging by the present uniform behaviour both of the causal organism and of the susceptible varieties in the various potato-growing countries.

Bonde (R.), Folsom (D.), & Tobey (E. R.). **Potato spraying and dusting experiments 1926 to 1928.**—*Maine Agric. Exper. Stat. Bull.* 352, pp. 97–140, 2 graphs, 1929.

The writers give a full account of their further experiments in potato spraying and dusting in Aroostook County, Maine, from 1926 to 1928 [*R.A.M.*, vi, p. 313].

In 1926 the increased yield obtained from spraying with home-made Bordeaux mixture (5–5–50) was inconsiderable, but in 1927 it amounted to 46 bushels per acre (14 per cent.) more than that of the untreated plots, a result which is regarded as highly significant. As in the previous year the increase was largely due to the control of late blight [*Phytophthora infestans*], which occurred in a severe form and was apparently conveyed by air currents from plots or fields some distance away. Within 36 hours of ideal climatic conditions, a single diseased leaflet was observed to result in infection for a radius of 10 feet. Colloidal copper, prepared by Dr. Wilcoxon of the Boyce Thompson Institute, Yonkers, New

York, and used at the rate of 4 pints of paste to 75 gallons of water, also gave some increase of yield (22·3 bushels or 6.49 per cent. per acre), and the disease was well controlled by Niagara 20–80 copper-lime dust, Niagara copodust, and sodium fluosilicate, but all these materials caused more or less severe burning of the foliage. In 1928, when late blight was again very severe, good control and heavy increases of yield were secured with Bordeaux mixture, half-copper-strength colloidal copper spray, copper-lime dust (Niagara 25–75), and Lucas-Kiltone dust (dried powdered Bordeaux) [ibid., viii, p. 53]. A new commercial copper spray known as 'Oxo Bordeaux' also controlled late blight in 1928, but a sodium fluosilicate-lime spray was ineffective.

The gain in yield from spraying was found to vary greatly with the season, averaging during 13 years' trials about 8 per cent. of the normal yield of 323 bushels per acre from the untreated plots. In five years' comparative tests in Aroostook County there was a slightly higher increase from the use of copper-lime dust than from Bordeaux spraying, both averaging some 5 per cent. over the standard yield of 323 bushels per acre. A review of reports from other parts of the United States indicates an apparent superiority of Bordeaux mixture over copper-lime dust in the control of flea-beetles (*Epitrix cucumeris*), leafhoppers (*Empoasca mali*), and tipburn.

A vine-protector device reduced the injury from sprayer wheels, resulting in a significant increase in yield of 19 bushels per acre (about 5 per cent.).

The vigour of seed stock was not found to be augmented by spraying the parent plants.

The analysis of leaf samples from the 1924, 1925, and 1928 tests showed that two or three times as much copper accumulates in the leaf-tissues with standard Bordeaux as with other materials, including dusts, even where the efficacy and yield increases are identical.

In Green Mountain potatoes the presence of mild mosaic [cf. ibid., viii, p. 121] was found to predispose the plants to late blight, possibly on account of the prostrate habit of growth and early maturing induced by the former disease.

In 1927 some 66 per cent. of early potatoes destined for southern markets developed rot in transit before the middle of September, after which date the incidence was only about 3 per cent.

No consistent correlation was found between tuber rotting by *P. infestans* and foliage injury from the same disease, the former type of damage varying with soil conditions.

In 1928 the total cost of spraying one acre of potatoes with Bordeaux mixture was about $11, the corresponding figures for 25–75 copper-lime dust, dried Bordeaux (spray), and dried Bordeaux (dust) being $19, $22, and $23, respectively. Colloidal copper is still in the experimental stage and not yet available commercially. Estimating the gross receipts at 70 cents per bushel, the average expected gain of 26 bushels would amount to about $18, which would justify the use of certain materials but not of others. In fact, the variability of seasonal and other conditions affects the

results of spraying and dusting to such an extent that its value in any given instance is really a matter for individual consideration.

HARTER (L. L.) & WHITNEY (W. A.). **Masking of Sweet Potato mosaic.**—*Phytopath.*, xix, 10, pp. 933–942, 3 figs., 1929.

Details are given concerning the masking of mosaic symptoms on Nancy Hall sweet potatoes [*R.A.M.*, vii, p. 19] kept in a greenhouse at a temperature round about 38° C. The typical symptoms of the disease (dark green coloration, deep indentation, and distortion of the leaves, with a superficial development of white pencilled lines running in all directions) are completely masked at this temperature, with or without accompanying high humidity. Masking was apparently retarded rather than augmented by a comparatively high relative humidity. The mosaic symptoms recurred on the new growth following the removal of the plants to lower temperatures.

POOLE (R. F.). **Sweet Potatoes infected by Schizophyllum commune.**—*Journ. Elisha Mitchell Sci. Soc.*, xlv, 1, pp. 137–139, 3 pl., 1929.

This is a record of the occurrence in 1927 of *Schizophyllum commune* on the Big Stem Jersey variety of sweet potato in North Carolina. Infected potatoes were found in several fields, but were not restricted to any specific area, such as well or poorly drained soils. There was no direct evidence from field observations indicating that the fungus was parasitic, but inoculation experiments on sweet potatoes with pure cultures gave positive results and produced a typical dry rot. Sporophores were produced after two months. This record adds a new fungus to the list of those that attack sweet potato during the period of dormancy.

GANDRUP (J.). **Phytophthora-aantasting van jonge oculaties.** [*Phytophthora* infection of young bud material.]—*De Bergcultures*, iii, 72, pp. 1839–1841, 1929.

During the latter part of the rainy season the author examined some dead *Hevea* rubber bud material which had apparently been killed by *Phytophthora* [*R.A.M.*, ix, p. 200]. The disease was observed in various stages in the budding beds. The first symptom is a small black spot on the green stem; later the edges of the lesion turn brown with dull patches in the centre. The lenticels of the surrounding green bark are plainly apparent as swollen yellow spots. The leaves are somewhat paler than the normal and in advanced cases they wither and drop, while at the same time the entire top of the stem turns brown and collapses. In the initial phase the diseased areas give the impression of having been scalded with boiling water. As in the case of older trees infected by *Phytophthora*, the bark of the diseased bud material develops fissures through which latex drops exude. The progress of infection was arrested with the onset of the dry weather.

The species of *Phytophthora* responsible for the attack is thought to be probably identical with that causing stripe canker [usually attributed in the Dutch East Indies to *P. palmivora*: cf. ibid., viii,

p. 674]. The organism is evidently present in the soil, for the tapped surfaces of the bark appear to be infected by spores splashed against them in drops of rain, since infection has only been observed within a short distance from the ground.

Control measures should be based on the maintenance of sanitary conditions in the budding beds, which must be kept fairly dry and receive plenty of light. The application of Bordeaux mixture would doubtless serve to prevent the spread of infection.

RAUM (H.). **Über Sortenwesen im bayerischen Hopfenbau und Wege der Hopfenzüchtung.** [On the varietal question in Bavarian Hop growing and methods of Hop breeding.]—*Fortschr. der Landw.*, iv, 11, pp. 342–345, 1929.

In connexion with a general dissertation on the question of varietal selection in Bavarian hop growing, the writer mentions the tendency to regard the well-known Hallertau variety as unsuitable for further cultivation on account of its susceptibility to *Peronospora* [*Pseudoperonospora humuli*: *R.A.M.*, viii, p. 602]. The higher incidence of infection on this variety, however, is often due less to inherent susceptibility than to the heavy, cold soils and abundant rainfall of the Hallertau region. The general replacement of the indigenous Hallertau variety by the less susceptible, late-maturing Saaz is not considered advisable, but growers must be prepared to make greater efforts in keeping the former free from disease.

YOSSIFOVITCH (M.). **Peronospora arborescens (Berk.) de Bary, parasite très important de Papaver somniferum en Yougoslavie.** [*Peronospora arborescens* (Berk.) de Bary, a very important parasite of *Papaver somniferum* in Jugo-Slavia.] —*Rev. Path. Vég. et Ent. Agric.*, xvi, 8, pp. 235–270, 12 figs., 2 graphs, 1929.

The detailed investigation of the mildew (*Peronospora arborescens*) of the opium poppy (*Papaver somniferum*), which is reported in this paper, was undertaken in view of the dangerous nature of the disease in southern Serbia [*R.A.M.*, vii, p. 536], where the poppy is cultivated on an extensive scale and is stated in normal years to give exceptionally high returns, estimated at from 10,000 to 15,000 dinars [£35 to £50] net profit per hect. In seasons favourable to the development of mildew, however, the crop is frequently reduced by one half or even almost entirely destroyed. The disease is greatly favoured by the local customs of cultivating the poppy for several years consecutively in the same fields, of leaving the débris of former crops on the soil, and of using manure prepared from diseased poppy seed capsules. The fungus (with which *P. effusa* var. *papaveris*, *P. grisea*, and *P. papaveris* are considered synonymous) was officially recorded in southern Serbia for the first time in 1927, when it was already causing considerable losses, but it is thought probable that it was already of long standing there.

Observations showed that the seedlings may be infected by *P. arborescens* from the moment of their germination, and that new infections occur during the whole period of growth, all the aerial

parts being equally susceptible. On autumn-sown poppies the disease frequently appears before the onset of winter. Plants that are infected in the cotyledonary stage are mostly killed outright. If infection occurs in young established plants, the growing point of the stems is almost always diseased, all the new leaves becoming infected from the very start and being rapidly killed. In older plants (from six leaves onwards) the disease may assume two forms, depending on whether the fungus reaches actively growing or mature tissue; in the latter case the parasite only causes a localized necrosis, with the consequent formation of more or less numerous and extensive brown spots. All the symptoms of the disease [which are fully described] have been reproduced experimentally by spraying healthy seedlings with spore suspensions of the fungus.

In the spongy parenchyma of the leaves the hyphae intertwine and form clumps which may fill up the intercellular spaces more or less completely. The mycelium also develops immediately below the epidermal cells, into which it sends haustoria. In young leaves the hyphae pass around the vascular bundles, but in older ones their progress is arrested by the veins. In the stems the mycelium chiefly develops in the cortical parenchyma, but also penetrates the central cylinder and may occasionally reach the pith. The haustoria are filiform, and generally branched. Besides normally developed conidiophores, the author also observed, on leaves containing oospores, simple, unbranched ones, bearing a terminal, elliptical conidium of normal size and shape. These conidiophores which, as far as he is aware, have not been previously described in *P. arborescens* or in any other species of the genus, may remain very short and bear a conidium at the moment of their emergence from a stoma, or they may elongate up to 60 μ and then produce the conidium at their apex.

The fungus produces conidia of two types on the poppy, namely, an oval form measuring 13 to 26 by 11 to 19·5 μ (average 18·7 by 16·3 μ), and an elliptical type, measuring 16 to 29 by 14 to 21 μ (average 23·3 by 16·3 μ). Oospores are formed early and in abundance. The diameter of the oogonia varies from 30·5 to 53 μ (mostly 37 to 41 μ) and that of the oospores from 23 to 39 μ (mostly 24 to 26 μ). It is pointed out, however, that the dimensions of the conidia and oospores are too variable to be of specific value.

The conidia germinate by the production of a germ-tube, the tip of which broadens out on coming in contact with a solid substratum. On the leaf the broadened tip of the germ-tube produces a thin hypha which penetrates the cell wall of the epidermis, below which it resumes the normal diameter of the germ-tube until it reaches the opposite cell wall, when the process is repeated. The optimum temperature for germination of the conidia was found to be 17° to 18° C. with a minimum between 4° and 7° and a maximum between 25° and 26°. On glass slides the conidia germinate only when in actual contact with water, but on the host a moderate degree of atmospheric moisture is sufficient to cause infection. In the field the incubation period of the mildew lasts 4 to 5 days during April and May, when the temperature ranges from 12° to 14° C.

The control measures recommended are a proper crop rotation (at least three years), the removal of all diseased plants and plant débris from the fields, which material should be either destroyed by fire or deeply dug in, the incineration of the stubble after harvest, and the use of pure seed from healthy plants. Although the disease does not appear to be seed-borne, as indicated by a special series of experiments, fragments of diseased seed capsules were shown to be a dangerous source of infection when mixed with the seed. Attempts to control the disease by cupric sprays have so far proved a failure, as the spray mixtures are not adhesive on the poppy leaves even with the addition of spreaders, such as soap and casein.

Yossifovitch (M.). **Peronospora arborescens (Berk.) de Bary, un grave parasite du Papaver somniferum.** [*Peronospora arborescens* (Berk.) de Bary, a serious parasite of *Papaver somniferum*.]—*Comptes rendus Acad. d'Agric. de France*, xv, 29, pp. 1010–1013, 1929.

This is an abridged version of the author's studies of the opium poppy mildew (*Peronospora arborescens*), an account of which has already been noticed [see preceding abstract].

Verslag der achtste Werkvergadering gehouden te Soerabaia op 18 tot en met 20 Maart 1929. [Report of the eighth Congress held at Soerabaja from 18th to 20th March, 1929, inclusive.]—*Versl. der Vereen. Chem., Tech.- en Landbouwkundig Adviseurs, 1929*, 7, pp. 295–351, 8 graphs, 1929.

The situation in Java in regard to pokkah boeng and top rot (*Fusarium*) [*Gibberella moniliformis*: *R.A.M.*, viii, p. 465], red stripe disease [*Phytomonas rubrilineans*: ibid., viii, p. 404], and gummosis ('gomziekte') [*Bacterium albilineans*: ibid., ix, p. 203] of sugar-cane was discussed at a meeting of the Agricultural Section of the Association of Chemical, Technical, and Agricultural Experts on 20th March, 1929. The incidence of pokkah boeng was observed on two estates to decrease in the later plantings (from 15·4 per cent. in May plantings to 3·4 per cent. in those in July in one case, and from 13 per cent. in April to 5 per cent. in August plantings in the other). Dr. Wilbrink and others mentioned the frequent coincidence between the attacks of pokkah boeng and those of shoot borers. No definite or consistent correlation could be traced between atmospheric and soil humidity and the occurrence of the disease. Opinions were also divided as to its effect on the yield of P.O.J. 2878.

Red stripe disease was more severe on P.O.J. 2952 than on 2878. Infection appears to spread from west to east, presumably following the course of the monsoon rains. There is considered to be no immediate cause for anxiety as regards *P. rubrilineans* in Java.

On certain estates the treatment of setts with 5 per cent. lysol (coloured with fuchsin or carthamin) against gummosis is compulsory; the cost of the operation is estimated at Fl. 15 per bouw [1 bouw = 0·76 hect.]. Dr. Wilbrink drew attention to a latent form of gummosis affecting the moderately resistant P.O.J. 2878

variety, in which there is little trace of exudation, but the tops of the canes show a marked reddening. The so-called 'false gummosis', a condition liable to confusion with the true disease, is characterized by the development of white or yellow, often red-speckled, sharply defined stripes on the leaves; in contrast to those of true gummosis, however, they are usually strictly localized and seldom extend into the stem or involve the vascular bundles. The P.O.J. 2878 variety is frequently affected by this condition, the cause of which is unknown. In the 'fourth disease' (so called because, like sereh, gummosis, and root rot, it is characterized by the red discoloration of the vascular bundles of the stem), irregular white stripes appear on the leaves. This disease is of a chronic nature, and in severe cases the canes die prematurely; complete recovery, however, is not unusual in milder types of attack. The P.O.J. 2878 and 2883 varieties are affected. Attempts to isolate bacteria from diseased leaves and stems gave negative results.

Gummosis in Barbados.—*Trop. Agriculture*, vi, 12, p. 340, 1929.

In this note it is stated that Dr. Briton-Jones has recently reported the occurrence of gummosis of sugar-cane [*Bacterium vascularum*: *R.A.M.*, viii, p. 669; ix, p. 203] in Barbados. Two important local varieties, Ba. 11,569 and 6,032 are affected, the former of which is very extensively grown, but so far the disease does not appear to have caused any appreciable loss.

Rands (R. D.). **Fungi associated with root rots of Sugar-Cane in the Southern United States.**—*Third Conf. Internat. Soc. Sugar-Cane Technologists*, Java, *Bull.* 33. [Abs. in *Trop. Agriculture*, vi, 12, pp. 347-348, 1929.]

In this communication the author described investigations which are being carried out by the United States Department of Agriculture into various root diseases of sugar-cane considered to be largely responsible for the degeneration of certain varieties. In Louisiana a striking contrast exists between the newly introduced, vigorous Java varieties P.O.J. 36, 213, and 234 [*R.A.M.*, ix, p. 132] and older canes, such as D. 74 and Purple. An extensive examination of recently rotted roots showed the presence of numerous fungi, including 11 species of *Pythium*, only one of which, however, was aggressively parasitic in inoculation experiments in steamed soil. This species, which possesses great variability and possibly several biological forms, appears to be identical with *P. arrhenomanes* [ibid., viii, p. 375]; the remaining species are tentatively considered to be weak parasites secondary to damage by soil fauna.

Smarods (J.). **Materiali Latvijas mikoflorai.** [Materials for the mycoflora of Latvia.]—*Rept. Latvian Inst. Plant Protect. 1928–29*, pp. 11–12, 1929. [Latvian, with English summary.]

The writer enumerates 29 species of fungi new to Latvia observed during the period under review (1st May, 1928 to 1st May, 1929).

McDonald (J.). **A list of plant diseases in Kenya Colony.**—*Kenya Dept. of Agric. Bull.* 5 of *1929*, 11 pp., 1929.

In this paper the writer endeavours to present as complete a list as possible of the known plant diseases of Kenya Colony. No attempt has been made to include non-parasitic fungi. Brief notes are given on some of the more important fungous diseases, most of which have already been noticed from other sources [cf. *R.A.M.*, viii, p. 632].

Davis (J. J.). **Notes on parasitic fungi in Wisconsin. XV, XVI, XVII.**—*Trans. Wisconsin Acad. Sci., Arts and Lett.*, xxiv, pp. 269–302 c, 1929.

This is a further continuation of the writer's series of notes on Wisconsin fungi [*R.A.M.*, v, p. 766] and comprises, *inter alia*, observations on species of *Ascochyta*, *Cercospora*, *Peronospora*, and *Septoria*. The list includes five new species, English diagnoses of which are given.

Ashby (S. F.). **Further note on the production of sexual organs in paired cultures of species and strains of Phytophthora.**—*Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 254–260, 2 figs., 1929.

After a brief reference to his previous papers on the development of oospores in paired cultures of species and strains of *Phytophthora* [*R.A.M.*, vii, p. 601 ; viii, p. 526], the author gives details of further experiments in which he studied the behaviour of *P. arecae* and *P. meadii* in pure and paired cultures. The results lead him to consider that both probably belong to the one species [in which case *P. arecae* would have priority], which may be separated into two groups of strains—the '*arecae*' and the '*meadii*' groups—distinguishable by their behaviour in paired culture. Similar experiments with *P. cryptogea*, *P. richardiae*, and *P. cinnamomi* would indicate that *P. richardiae* is only a variety of *P. cryptogea*; *P. cinnamomi* appears to stand nearer to *Blepharospora* [*P.*] *cambivora* than to *P. cryptogea* [see next abstract].

Ashby (S. F.). **The production of sexual organs in pure cultures of Phytophthora cinnamomi Rands and Blepharospora cambivora Petri.**—*Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 260–263, 2 figs., 1929.

Similar sexual organs [a description of which is given] have been found by the author in pure cultures of *Phytophthora cinnamomi* and *Blepharospora* [*P.*] *cambivora* on slanted maize-meal agar, and in a paired culture of the two organisms on the same medium. This fact is considered to strengthen the view that *P. cinnamomi* and *P. cambivora* are closely related to each other [see preceding abstract].

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SPRAGUE (R.). **Host range and life-history studies of some leguminous Ascochytae.**—*Phytopath.*, xix, 10, pp. 917-932, 3 pl., 1929.

The main objects of this paper are (1) to present an account of the life-history and pathogenicity of hitherto recorded species of *Ascochyta* on legumes, and (2) to list their known hosts and make critical revisions in species in accordance with the information thus elicited. The discussion centres round the species occurring in nature on *Vicia villosa*, *V. sativa*, *V. angustifolia*, *V. faba*, *Lathyrus odoratus*, *L. tingitanus*, *Medicago sativa*, *M. lupulina*, *Phaseolus* spp., and peas.

All the forms of *Ascochyta* attacking vetches in the United States appear to fall within the *A. pisi* group [*R.A.M.*, viii, p. 416]. The fructifications of *A. pisi* on *V. faba* approximate to the pseudopycnidia of Diedicke (*Ann. Mycol.*, x, p. 135, 1912) and others. Diedicke's genus *Stagonosporopsis* is based on the presence of loosely formed pycnidia and the production of a variable percentage of multiseptate spores. An examination of many cultures and of host material, together with a study of *A.* (*S.*) *boltshauseri* [also known as *S. hortensis*: ibid., i, p. 152], has convinced the writer that the term pseudopycnidium is not applicable to this group, and that the genus *Stagonosporopsis* is untenable.

The diagnosis of *A. pisi* is revised and extended to cover the range of the present studies. The symptoms caused by the fungus on peas, *Vicia* spp., and *V. faba* are concisely indicated. On the first-named host the pycnidia measure 75 to 225 μ and the uni- to triseptate spores 10 to 14 (6 to 19) by 3 to 5 (2·5 to 6) μ, with an average length of less than 13·5 μ. On *V.* spp. the pycnidia measure 60 to 225 μ and the 1- to 4-septate spores 10 to 17 (8 to 25) by 2·5 to 5 (2 to 6) μ. The pycnidia of the fungus on *V. faba* measure 80 to 250 μ and the 1- to 4-septate spores 14 to 25 (12 to 28) by 3·5 to 5 (3 to 7) μ, with a mean spore-length usually exceeding 17 μ.

A. pinodella [ibid., vii, p. 611] appears to be the most prevalent species of *Ascochyta* on peas in the arid western regions and it is also of frequent occurrence in the east. In nature the fungus seems to be confined to peas, but under greenhouse conditions it

attacks *V. sativa* with great severity, *V. villosa* and *V. pannonica* being relatively resistant. Confusion may be caused by the obscure nature of the common symptoms of *A. pinodella* and the association both of this organism and *A. pisi* with *Peronospora viciae* [ibid., vii, p. 490] and some non-pathogenic forms of *Phoma*.

Mycosphaerella pinodes [loc. cit.] was found capable of attacking a wide range of hosts, often in a virulent manner, under the conditions of these experiments. *Vigna sinensis, Cicer arietinum*, and *Lupinus polyphyllus* proved susceptible both to *M. pinodes* and *A. pinodella*. Failure to find *M. pinodes* on vetches is believed to be attributable to a late-season parasitism which has escaped the notice of workers collecting early in the summer. The presence of *M. pinodes* in *Lathyrus tingitanus* affected by foot rot was clearly of a pathogenic nature.

A. lathyri is the common species on *L. odoratus* in America. The spores are smaller than those of *A. pinodella* and in one collection measured 9·4 by 3·6 μ compared with 8 to 14 by 2·5 to 3·5 μ as originally described by Bubák and Kabát for the variety *lathyri-odorati* (*Hedwigia*, lii, p. 347, 1912). The species also differs from *A. pinodella* in incubation period, host range, and cultural characters. *M. ontarioensis* (*Phytopath.*, v, p. 4, 1915) is believed, though definite proof is lacking, to be identical with *A. lathyri*.

A. imperfecta [*R.A.M.*, v, p. 723] caused infection on a large number of hosts, but pycnidia and definite symptoms developed only on lucerne and bur clover (*Medicago hispida*), the latter probably acting as a means of transmission in the field. *A. imperfecta* differs from *A. medicaginis* [ibid., ix, p. 249] in its smaller, frequently non-septate spores. The systematic position of a fungus collected on lucerne in Wyoming, and Spokane, Washington, and referred by Saccardo to *A. pisi* var. *medicaginis*, is ambiguous. The spore characters are not irreconcilable with *A. imperfecta*, but the position of the pycnidia on the stem is unusual. A single inoculation may result in the development on the leaves of pycnidia belonging to *Ascochyta*, and on the stem of the same plant of *Diplodina* fructifications. The writer is inclined provisionally to refer this material to *A. imperfecta*.

A. phaseolorum, characterized by short, cylindrical spores (average 7 by 2·5 μ) and large pycnidia, 135 to 180 μ, was found on *Phaseolus lunatus* at Takoma Park, D.C. The spores were clearly septate and the cross walls prevent it from being confused with the *Phomopsis* stage of *Diaporthe phaseolorum*. It was further shown incidentally that *A. phaseolorum* is distinct from *Phyllosticta phaseolina*.

CHAPMAN (A. C.). **A new species of Oidium.**—*Trans. Brit. Mycol. Soc.*, xiv, 3-4, pp. 291–293, 1 pl., 1929.

A brief morphological and cultural account is given of a species of *Oidium* [? *Oospora*] which was found obstructing a sewer connecting a factory with the main sewer of a town [in the British Isles]. The growth produced by the fungus consisted of a brown gelatinous mass, having the toughness of soft leather. The organism most closely resembled *O. matalense* isolated in 1915 by Castellani

who, however, after examining a culture of it, stated that in his opinion it was a different species, or at least a distinct variety of *O. matalense*.

Wolf (F. A.). **The relationship of Microstroma juglandis (Bereng.) Sacc.**—*Journ. Elisha Mitchell Sci. Soc.*, xlv, 1, pp. 130–136, 1 pl., 1929.

The author states that the lack of agreement between himself and Miss Pires in regard to the systematic position of *Microstroma juglandis* [*R.A.M.*, vii, pp. 406, 407] led him to re-examine the slides used in his previous work and to make a critical study of further collections on hickory leaves [*Hicoria* spp.]. In discussing the morphological and cytological details of the organism, he points out that the characters that led Miss Pires to conclude that it should be placed among the Basidiomycetes are the presence of clavate basidia bearing a constant number of sterigmata, on each of which are produced single, non-catenulate spores; the existence of clamp-connexions, and the occurrence of binucleate mycelial cells. In regard to the last point, he states that his own observations, which agree with those of Maire (La structure et la position systématique des *Microstroma* et *Helostroma*, pp. 133–139, Nancy, 1913), show that the cells of the mycelium are almost always uninucleate, although occasional cells were observed to be binucleate. In respect of the structures that were interpreted by Miss Pires as clamp-connexions, his study showed that the branches may be separated from the parent hypha by a septum at the juncture with the latter, followed by the formation in the parent hypha of a septum at right angles to the basal septum of the branch, which thus appears to arise from two cells; the fact that these apparent clamps are segmented and give rise to other similar formations, leads to the conclusion that they merely represent a peculiar mode of branching.

The reasons which incline the author to regard *M. juglandis* as an imperfect fungus are (1) the polynuclear condition of the conidiophores, (2) the presence of nuclei in cells bearing a crown of mature spores, (3) the presence in the same pustule of very young, intermediate, and mature conidiophores, (4) the attachment of symmetrical spores with a central basal hilum, (5) the absence of clamp-connexions, (6) the occurrence of uninucleate cells in the vegetative mycelium, and (7) the absence of conjugate nuclei.

Beecher (F. S.) & Shapovalov (M.). **Tomato die-back or tip blight found in inland areas of California.**—*Plant Disease Reporter*, xiii, 11, p. 148, 1929.

In June, 1929, the disease known as 'die-back' or 'tip blight' of tomatoes, which has caused practically the abandonment of tomato growing in the coastal areas of California, was found in commercial plantings near Merced, in the interior of the State, causing an average infection of 10 per cent. The disease was further observed in early August near Riverside in plantings interset among lemon trees, the incidence of infection, which was highest in the wetter parts of the fields, ranging from 4 to 50 per

cent. The disturbance is considered to be somewhat analogous to streak [*R.A.M.*, viii, p. 758] and spotted wilt [ibid., vii, p. 410].

KOTTE (W.). **Der Bakterienkrebs, eine für Deutschland neue Tomatenkrankheit.** [Bacterial canker, a Tomato disease new to Germany.]—*Obst- und Gemüsebau*, lxxv, 10, pp. 186–188, 3 figs., 1929.

Recent investigations have confirmed suspicions aroused in 1927 as to the occurrence in Germany of bacterial canker of tomatoes (*Aplanobacter michiganense*) [*R.A.M.*, viii, p. 635]. The symptoms of the disease are briefly described in popular terms, and directions are given for its control by cultural measures and the immersion of seedling roots in a solution of 0·5 per cent. uspulun mixed with clay to prevent soil infection. It is believed that the causal organism was introduced into Germany with consignments of tomatoes from America or Italy, where the disease is also reported to occur.

PLANTZ (P.). **Vorbeugende Massnahmen gegen Krankheiten der Gewächshaustomaten!** [Precautionary measures against diseases of greenhouse Tomatoes.]—*Obst- und Gemüsebau*, lxxv, 7, pp. 136–137, 1929.

Directions are given in popular terms for the prevention of leaf mould (*Cladosporium fulvum*), canker (*Didymella lycopersici*), and late blight (*Phytophthora infestans*) of greenhouse tomatoes in Germany. One of the most important precautionary measures against these diseases is the provision of subterranean irrigation as practised in Holland [*R.A.M.*, viii, p. 533], or, failing this, of flat grooves for the passage of the water. Another essential factor in the health of the plants is dry, circulating air. Seedlings should be sprayed fortnightly with 0·5 per cent. uspulun, which should be replaced by 0·5 per cent. solbar when the fruits reach the size of a walnut. This preparation or 1 per cent. Bordeaux mixture may also be used in the early stages.

SASTRI (B. N.) & SREENIVASAYA (M.). **Contributions to the study of spike disease of Sandal (Santalum album, Linn.). Part VII. Factors influencing diastatic activity.**—*Journ. Indian Inst. Sci.*, xii A, 17, pp. 233–238, 2 graphs, 1929.

In continuation of previous investigations on the etiology of spike disease of sandal (*Santalum album*) in Mysore [*R.A.M.*, ix, p. 213], the writers made further chemical analyses [the results of which are tabulated and expressed by graphs] of spiked and healthy leaves. The higher diastatic activity of spiked tissues, as compared with healthy ones, was found to be due partly to a higher concentration of the enzyme, partly to the presence of activators such as phosphates and amino-acids, and partly to the higher acidity of the diseased tissues, corresponding approximately to the optimum hydrogen-ion concentration of plant diastase. The lower diastatic activity of the healthy tissues cannot be attributed to the presence of inhibitors retarding their amyloclastic capacity.

Sreenivasaya (M.) & Sastri (B. N.). **Contributions to the study of spike disease of Sandal (Santalum album, Linn.). Part VIII. Chemical composition of tissue fluids from the leaf.**—*Journ. Indian Inst. Sci.*, xii A, 17, pp. 239–244, 1929.

Continuing their studies on the spike disease of sandal (*Santalum album*) [see preceding abstract], the writers ascertained, by chemical analyses of the tissue fluids of the leaves, that the spiked foliage contains less ash and calcium and more nitrogen, maltose, and reducing sugars than that of healthy trees.

Sreenivasaya (M.) & Sastri (B. N.). **Contributions to the study of spike disease of Sandal (Santalum album, Linn.). Part IX. Chemical composition of tissue fluids from the stem.**—*Journ. Indian Inst. Sci.*, xii A, 17, pp. 245–250, 1929.

The results [which are tabulated and discussed] of chemical analyses of the tissue fluids from spiked and healthy sandal (*Santalum album*) stems [see preceding abstracts] showed that the former contain more nitrogen, phosphorus, and calcium than the latter. In the Uttarahalli area the average amount of calcium found was about 17 per cent. higher in diseased than in healthy stems, a result which is in marked contrast to that obtained with the leaves. A high gradient of calcium concentration exists from the stem towards the leaf which tends to flatten as the disease progresses. Possibly the rapid transport of calcium through the stem is impeded by the effects of spike, so that the leaf does not receive its adequate share of the calcium, one of the functions of which is to prevent abnormalities in the translocation of starch.

Sastri (B. N.). **Note on the starch-liquefying action of Sandal leaf extracts.**—*Journ. Indian Inst. Sci.*, xii A, 17, pp. 251–252, 1929.

The abnormal accumulation of starch in spiked leaves of sandal (*Santalum album*) [*R.A.M.*, i, p. 324 and preceding abstracts] suggests defective translocation of the carbohydrate, possibly due to an insufficient proportion of the liquefying fraction. An investigation of the hydrolysis of potato starch by spiked and healthy leaf extracts showed that, for equal weights of sugar produced, more starch is liquefied by the latter than by the former. These results were confirmed by measuring the fall in viscosity of the reaction mixture containing potato starch and leaf extracts; this was found to be more rapid in the case of mixtures containing healthy leaf extracts than in those with spiked ones.

Iyengar (A. V. V.). **Contributions to the study of spike disease of Sandal (Santalum album, Linn.). Part X. Seasonal studies on healthy and partially spiked trees.**—*Journ. Indian Inst. Sci.*, xii A, 20, pp. 295–305, 1929.

Further studies [the results of which are tabulated and discussed] on the metabolism of sandal (*Santalum album*) leaves during the development of spike disease [see preceding abstracts] showed that the tissue fluid from the diseased leaves of a partially spiked tree contains less dissolved matter than that from a healthy one. The reaction of the former tended to become more acid, while that of the

latter remained about the same throughout the investigation. The osmotic concentration of the sap from the diseased specimen was less than that from the healthy ones. The electrical conductivity of the sap from the spiked leaf was generally greater than that from the healthy one and showed an inclination to increase with time. Irrespective of seasonal variations, the diseased tissues were found to contain more moisture, ash, and nitrogen, and less calcium than healthy ones. The ratio of calcium to nitrogen was markedly lower in affected than in healthy tissues.

LANGHOFFER (A.). **Le dépérissement du Chêne en Yougoslavie, spécialement dans la Slavonie.** [The dying-off of the Oak in Jugo-Slavia, especially in Slavonia.]—*Rev. Eaux et Forêts*, lxvii, 11, pp. 763–765, 1929.

The writer's lengthy experience and extensive observations in the forests of Jugo-Slavia have convinced him that the gradual depletion of the oak stands is due mainly to insects (especially *Lymantria dispar*), and only in a secondary degree to *Microsphaera alphitoides* (*Oidium quercinum*) [*M. quercina*: *R.A.M.*, viii, p. 687]. In the absence of the insects the attacks of the fungus on the young leaves are not as a rule serious, since the temperature at this stage has not reached the optimum for the development of the mildew (26° to 28° C.). *Armillaria mellea* also damages the trees already injured by insects.

PETERSONS (P.). **Checking experiments against Microsphaera alphitoides Griffon et Maublanc.**—*Rept. Latvian Inst. Plant Protect. 1928–29*, pp. 7–8, 2 figs., 1929. [Latvian, with English summary.]

Of a number of standard fungicides tested against oak mildew (*Microsphaera alphitoides*) [*M. quercina*: see preceding abstract] in Latvia during 1928–9, lime-sulphur (32° Beaumé, 1 in 50) proved the best and cheapest.

GUYOT (R.). **Particularités de culture du mycélium d'Armillaire en milieu stérile.** [Cultural peculiarities of the mycelium of *Armillaria* in a sterile medium.]—*Compte rendu 52e Session Assoc. Franç. pour l'Avancement des Sciences*, La Rochelle, pp. 581–586, 5 figs., 1928. [Received February, 1930.]

Continuing his experiments on the action of antiseptics on *Armillaria mellea* [*R.A.M.*, viii, p. 590], the writer added appropriate concentrations of various phenols or their derivatives to cultures of the fungus on different nutrient media (agar and acorns, &c.). It was found that hydroquinone (0·50 gm. per 100 l.), resorcin (0·10 per 100), naphtol β (0·10 per 100), metol (0·10 per 100), tannin (0·50 per 100, in the form of a laboratory product but not in its natural state), and methylene blue (0·20 per 100), all exerted a marked antiseptic action, preventing or retarding the development of the rhizomorphs and of luminescence. The phenols further revealed the presence of oxydases by the coloration produced in the cultures under their influence.

Guyot (R.). **De l'influence des insectes xylophages dans la propagation de l'Armillaire.** [On the part played by xylophagous insects in the propagation of *Armillaria*.]—*Compte rendu 52e Session Assoc. Franç. pour l'Avancement des Sciences*, La Rochelle, pp. 391–393, 1928. [Received February, 1930.]

Trees attacked by *Armillaria* [*mellea*: see preceding abstract] are frequently parasitized in a secondary capacity by a number of insects [which are enumerated]. All these insects may act as mechanical agents in the spread of the fungus. A case in point is the severe die-back of young elms now proceeding at Royau [Charente-Inférieure, west of France], associated with the combined infection of *A. mellea* and insects. In the same district pines are simultaneously attacked by *A. mellea* and termites. Some analogous cases from contemporary literature are briefly cited.

Ellis (E. H.). **Armillaria mellea in a mine-working.**—*Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 305–307, 2 figs., 1929.

It is stated that rhizomorphs of *Armillaria mellea* have been found at a point eighty feet underground in a tunnel in course of construction at Tutbury, Staffordshire [cf. *R.A.M.*, viii, p. 281]. Investigation indicated that the rhizomorphs originated from fallen-in timbering of an old mine-working on the opposite side of the hill, and had traversed a distance of some 22 yards apparently through fissures in the marl and gypsum made by water action.

Bagchee (K.). **A new species of Cronartium from the Himalayas.**—*Nature*, cxxiv, 3131, pp. 691–692, 2 figs., 1929.

The writer states that the *Cronartium* stage of *Peridermium himalayense*, a serious parasite of *Pinus longifolia* in north and north-western India [*R.A.M.*, ix, p. 146], has been discovered on the annual herbs, *Swertia alata*, *S. angustifolia*, and *S. cordata*. The genetic connexion between the two stages of the rust has been proved by cross-inoculation experiments (details of which are reserved for future publication). The *Swertia* species appear shortly after the early monsoon rains, at which time infection takes place through the aecidiospores from neighbouring diseased pines. The plants die off after about four months at the end of the autumn. Herbarium specimens of *S. alata* and *S. cordata* collected between 1891 and 1894 in widely separated localities of the Punjab and United Provinces Himalaya, were found to bear *Cronartium* on the leaves.

Roeser (J.). **The occurrence of 'pitch girdle' in sapling Douglas Fir stands on the Pike National Forest.**—*Journ. of Forestry*, xxvii, 7, pp. 813–820, 1929.

'Pitch girdle' is the local name for a disease of Douglas fir [*Pseudotsuga taxifolia*] saplings in the Pike National Forest, near Sedalia, Colorado [*R.A.M.*, viii, p. 476]. The first symptom is a very slight flow of pitch from apparently healthy bark on the main stem, often at or near the base of a branch. Infection spreads through the outer bark and round the stem, and under

suitable conditions the cambium is destroyed. This is followed by disruption of the bark and the appearance of cankers. If favourable conditions for infection persist, the cambium is ultimately encircled and the upper part or the whole of the tree is killed. The trees may be attacked at any part from below ground level to some 20 ft. up the stem.

The affected stands were examined in 1927 by Dr. C. Hartley, who found the canker similar in various respects to the *Phytophthora* disease of cacao [*P. palmivora*]. Probably the causal organism inhabits the outer bark of Douglas firs and becomes virulent under propitious soil and environmental conditions. The association of the disease with overstocked stands seems to indicate that penetration of the cambium occurs only under such conditions. Dr. H. Metcalf believes the disease to be new to science. It is definitely distinct from the larch canker [*Dasyscypha calycina*] occurring on *P. taxifolia* in Massachusetts [ibid., viii, p. 744], and the occasional association of *Valsa abietis* with the canker is not considered significant.

The results [which are discussed and tabulated] of observations on the occurrence of pitch girdle in thinned and unthinned plots indicate that the disease is most prevalent in the latter, though a steady increase of infection was registered in all plots (lightly and heavily thinned as well as unthinned) in 1927 compared with 1924. The percentage of infection in the unthinned plot in 1927 was 67·3 (45·1 in 1924), the corresponding figures for the heavily thinned plot being 30·7 and 16·5, respectively. The disease mainly affects the trees in the 3-inch diameter class. The percentage of all dead trees killed by pitch girdle since 1924 is estimated at 74·7, 67·6, 52·6, and 20 in the unthinned, lightly, moderately, and heavily thinned plots. In the unthinned control stand three deaths were found to be due to pitch girdle for each one from all other natural causes, the ratio in the heavily thinned stand being 1 to 4. Between one-half and two-thirds of the diseased trees are at present lightly attacked, while 9 to 19 per cent. are suffering heavy infection. Only 0·1 per cent. of the lightly infected trees are dead and 99 per cent. can be classed as thrifty; the corresponding figures for moderately heavy attack being 6·1 and 89·1 per cent., and for the badly diseased group 20·1 and 70·4 per cent., respectively.

Pitch girdle has been found to be most prevalent among trees with intermediate and dominant crown canopies, rather than on suppressed individuals, the relative resistance of which may possibly be due to the comparatively small percentage of thin-walled cells in the outer wood and bark. There is some evidence that the disease weakens the resistance of the trees to snow injury, and also that it retards the growth of the smaller trees.

Hedgcock (G. G.). **Septoria acicola and the brown spot disease of Pine needles.**—*Phytopath.*, xix, 11, pp. 993–999, 1 fig., 1929.

The brown spot disease of pine needles (*Septoria acicola*) [*R.A.M.*, iv, p. 527], which has caused serious damage during the last ten years to *Pinus palustris*, *P. taeda*, *P. caribaea*, and other species in the southern United States, is characterized by small

grey-green, later brown, irregularly circular spots girdling the needles and ultimately killing the portions beyond the point of attack. Each successive season's growth of needles is infected, with the result that the trees are nearly defoliated every year and suffer a considerable retardation of growth or may even be killed. The disease is most prevalent among trees in grassy, unburned tracts. After the trees reach a height of 5 ft. the injury caused by *S. acicola* is inconsiderable.

The fungus was readily isolated from diseased needles and inoculated into the above-mentioned species of pine with positive results. An English diagnosis of *S. acicola* (with which *Cryptosporium acicolum* Thüm., *Actinothyrium marginatum* Sacc., *Lecanosticta pini* Syd., *L. decipiens* Petr., and *L. acicola* (Thüm.) Syd. are considered to be synonymous) is given. The acervuli are amphigenous, at first globose, 50 to 100 μ in diameter, becoming elongated up to 1·5 mm., seated in the mesophyll and discharging spores through a cleft in the epidermis. There is a basal layer of coloured compact pseudoparenchyma. The subhyaline to smoky, uni- to triseptate, curved spores measure on an average 29·5 by 3·8 μ with a sextile range (the part remaining after the sixth of the spores that are smallest and the sixth that are largest have been discarded) of 27 to 32 by 4 to 5 μ. The acervuli occur on the brown spots formed on living pine needles and on other paler portions of dead needles. In its natural form of reproduction this organism differs from the typical species of both *Cryptosporium* and *Septoria*, but it is retained in the latter genus on account of the production in culture of coal-back, subspherical pycnidia in crowded layers.

The study of the host range and geographical distribution of *S. acicola* has shown that it occurs in eleven States on nine other species of pine besides those mentioned above, including *P. echinata*, *P. glabra*, *P. nigra austriaca*, *P. ponderosa*, *P. rigida*, and *P. virginiana*. Chapman's record of *S. pini* on *P. palustris* [ibid., vi, p. 66] is considered to refer to *S. acicola*. Good control of brown spot in nurseries has been obtained at Bogalusa, Louisiana, by fortnightly applications during the spring of Bordeaux mixture or lime-sulphur. The author recommends the use of the former at a strength of 4–4–50, with the addition of 2 lb. whale-oil or casein soap (e.g., kayso) per 50 galls. of solution.

Wilson (M.) & Hahn (G. G.). **The history and distribution of Phomopsis pseudotsugae in Europe.**—*Phytopath.*, xix, 11, pp. 979–992, 2 figs., 1929.

This is a condensed account of the authors' investigations, already noticed [*R.A.M.*, viii, p. 278], on the history and distribution in Europe of the Douglas fir (*Pseudotsuga taxifolia*) canker caused by *Phomopsis pseudotsugae*, and of the relationships between this fungus and *Sclerophoma magnusiana* (*Phoma pitya*) and *Phomopsis abietina* (*Phoma abietina*).

Knoche (W.), Cruz-Coke (E.), & Pacotet (M.). **Der 'palo podrido' auf Chiloe. Ein Beitrag zur Kenntnis der natürlichen Umwandlung des Holzes durch Pilze in ein Futter-**

mittel. [The 'palo podrido' on Chiloe. A contribution to the knowledge concerning the natural conversion of wood into fodder through the action of fungi.]—*Centralbl. für Bakt.*, Ab. 2, lxxix, 15–22, pp. 427–431, 1929.

Details are given concerning the conversion of the wood of three trees occurring on Chiloe Island [off the coast of Chile], namely, *Eucryphia cordifolia*, *Nothofagus dombeyi*, and *Weimannia trichosperma*, into a palatable fodder for live stock through the action of a fungus belonging to the *Mucor chlamydosporus racemosus* group. The smell and taste of the whitish mass into which the wood is transformed are slightly reminiscent of fresh mushrooms, and the converted substance constitutes a valuable addition to pasturage on the island, where stable fodders are unknown. Owing to its relative scarcity, 'palo podrido' [decayed wood] is sold at a fairly high price.

The hyphae of the fungus [the cultural and biochemical characters of which are briefly described] may be seen, on microscopic examination of the mass, between the skeleton fibres of the wood. In Petri dish cultures of fragments of the rotted wood at 5° to 7° C. dark purple masses of conidia appear on the surface in 14 days, while within the wood dark chlamydospores are formed between the fibres; black sporangia develop in two months. Zygospores are formed at the surface of Raulin's medium and other substrata, while yeast-like cells develop at the bottom of the culture. Fermentation, characterized by pleasant odours (e. g., of plums or chocolate), takes place as a result of the activity of the yeast stage. The fungus is accompanied by various bacteria, which facilitate its progress through the tissues.

Lackey (C. F.). **Attenuation of curly top virus by resistant Sugar Beets which are symptomless carriers.**—*Phytopath.*, xix, 10, pp. 975–977, 1929.

Further investigations on the attenuation of the curly top virus by resistant sugar beets [*R.A.M.*, viii, p. 283] led to the discovery, among the most resistant strains, of some apparently healthy individuals showing no trace of the usual symptoms. Each plant in the field had been artificially infected by viruliferous leafhoppers (*Eutettix tenella*) and also exposed to a fairly heavy natural infestation, and all the other individuals developed the symptoms of curly top in the ordinary way, indicating that the symptomless plants had been well inoculated.

Experiments were conducted to determine whether or not the virus was present in these apparently healthy sugar beets, and the degree of its attenuation if present. Non-viruliferous leafhoppers were caged on detached young, inner leaves for two to three days and subsequently caged in lots of 10 to healthy, young, susceptible beets. Similar plants inoculated with viruliferous leafhoppers were used as controls. In 10 to 37 days all the plants inoculated with virus from the symptomless carriers became diseased, though less severely and generally more slowly than the controls. In one case the virus from a certain strain of resistant carriers produced very mild symptoms of curly top after 37 days; the plant recovered completely in about five weeks. In most cases,

however, the action of the virus from the symptomless carriers was comparable to that of the infective principle from plants showing mild to moderate effects.

STARRETT (RUTH C.). **A new host for Sugar Beet curly top.**—*Phytopath.*, xix, 11, pp. 1031–1035, 1 fig., 1929.

The list of hosts of curly top [*R.A.M.*, viii, p. 83] has been extended by the detection of the symptoms in *Oxalis stricta*. The first diseased plant appeared as a volunteer in a pot containing a caged beet plant affected by curly top. The *Oxalis* plant showed the presence of marked papillae along the veins on the under side of the leaves, which were severely curled and twisted. The plant was considerably stunted but remained green and produced seed in the normal way. Non-viruliferous individuals of *Eutettix tenella* were allowed to feed on the *Oxalis* plant for a week, transferred to healthy beet leaves for two days, and then returned to the *Oxalis*. Curly top symptoms developed in 24 days on the beets and rapidly became severe. Non-viruliferous leafhoppers were caged on one of these diseased beet seedlings and subsequently transferred to four healthy *O. stricta* plants, which developed unmistakable signs of curly top in about a month. Insects were then placed on one of the curly top *Oxalis* plants and later transferred to four healthy ones, two of which showed definite symptoms of curly top in about 18 days. Negative results were obtained in all the tests in which *Agallia constricta* and *A. sanguinolenta*, relatives of the leafhoppers associated with the transmission of curly top in the Argentine [ibid., vii, p. 355], were substituted for *E. tenella*.

SCHNEIDER (F.). **Neuere Erfahrungen über Zuckerrübensorten.** [Recent researches on Sugar Beet varieties.]—*Der Züchter*, i, pp. 59–66, 1929. [Abs. in *Resumptio Genetica*, iv, 3, pp. 110–111, 1930.]

A comprehensive survey is given of the principal modern tendencies in sugar beet selection, one of the chief aims of which is the development of varieties possessing resistance to fungi (*Cercospora beticola* and *Peronospora*) [*schachtii*: *R.A.M.*, viii, pp. 350, 695, *et passim*] and insects.

GROPP. **Beobachtungen über den Zusammenhang von Bodenreaktionen und Zuckerrübenaufgang im Jahre 1929.** [Observations on the relation between soil reactions and Sugar Beet germination in the year 1929.]—*Deutsche Zuckerind.*, liv, 40, pp. 1065–1068, 8 figs., 1 diag., 1929.

Observations made in the spring of 1929, following an exceptionally long and severe winter, on an estate in Silesia showed that root rot or blackleg of sugar beets [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*] was most prevalent in excessively acid soil (P_H 6 or below) [*R.A.M.*, viii, p. 418; ix, p. 152]. Applications of lime, bringing the reaction to about P_H 7, resulted in a speedy improvement of the condition.

Walker (J. C.), Link (K. P.), & Angell (H. R.). **Chemical aspects of disease resistance in the Onion.**—*Proc. Nat. Acad. Sci.* [Washington], xv, 11, pp. 845–850, 1929.

The basic reason for the marked resistance of coloured onion bulbs to smudge (*Colletotrichum circinans*) [*R.A.M.*, vii, p. 337] appears to be the presence, in the scales of such bulbs, of one or more substances, toxic to the fungus, which are absent from those of the white varieties [see next abstract]. Being soluble in cold water this substance diffuses out readily from the dead cells of the outer scales into drops or films of water in contact with the bulbs. It thus retards or kills the fungus before the latter can establish itself on the host tissue.

By means of an extraction process [the technique of which is fully explained] a phenolic acid known as protocatechuic acid (3, 4-dihydroxybenzoic acid) was isolated from the resistant bulbs of the yellow and red varieties. The evidence points to the conclusion that this acid is one of the chief toxic substances constituting the disease-resistant principle of coloured onions. It could not be obtained from the white varieties. Moreover, at dilutions of 1 in 2,000 to 1 in 3,000 in distilled water it caused the typical rupture of the spores of the fungus which is a characteristic property of the crude aqueous extract from coloured scales. This is believed to be the first case of disease resistance in plants determined to be due to the presence of a definite chemical entity.

[A more detailed account of the isolation and identification of protocatechuic acid appears in *Journ. Biol. Chem.*, lxxxi, 2, pp. 369–375, 1929.]

Link (K. P.), Dickson (A. D.), & Walker (J. C.). **Further observations on the occurrence of protocatechuic acid in pigmented Onion scales and its relation to disease resistance in the Onion.**—*Journ. Biol. Chem.*, lxxxiv, 2, pp. 719–725, 1929.

The protocatechuic acid content of pigmented onion scales [see preceding abstract] was found to vary considerably. The acid is virtually or entirely absent from the unpigmented portions of the coloured bulbs, i. e., at the top and near the neck, and present in the highest quantities in the outer scales showing the most extensive pigmentation. Badly bleached scales have a much lower protocatechuic acid content than fresh, well-preserved ones. Protocatechuic acid is much more soluble than the pigments with which it is associated in the coloured scales, indicating that its concentration would be reduced by the gradual leaching action of soil and meteoric water. Some lots of red scales subjected to considerable leaching yielded only minute traces of the acid, though there was a good deal of pigment left.

Although red onions are equally resistant with the yellow varieties to smudge (*Colletotrichum circinans*) under field conditions, the highest concentration of protocatechuic acid has so far been found in the yellow scales. However, the general average yield of the acid from bleached scales has been higher from red onions. The isolation of the protocatechuic acid in the pure state has been found, by repeated experiments, to be more readily accomplished from the extracts of the yellow scales. The acid is easily separated

from quercetin, the yellow onion pigment, on account of the relative insolubility of this substance in water. However, a portion of the red scale pigments is appreciably more soluble in water than quercetin.

An improved method of isolating protocatechuic acid is described, whereby larger yields are obtained and minute amounts of the substance can be extracted from scales exposed to heavy leaching. The pigmented scales dried at 80° C. are extracted for 24 hours with dry acetone in a large type of Soxhlet extractor devised by Sando (*Indus. & Engin. Chem.*, xvi, p. 1125, 1924). The acetone extract is concentrated to dryness in a vacuum of 15 mm. pressure at 30°. The residue is taken up with water, thereby effecting an almost complete separation of the water-soluble substances from the quercetin and a dark gum-like substance. Basic lead acetate is added to the aqueous solution, which contains practically all the protocatechuic acid and some pigment impurities other than quercetin, until complete precipitation is accomplished. The reddish-brown lead precipitate is filtered off, washed with cold water, and decomposed with 10 per cent. sulphuric acid added to a large volume of water at 85° to 90°, in which the precipitate is suspended. After the lead sulphate has settled out, the supernatant liquor is filtered off and concentrated to a small volume under reduced pressure at 45°. The resulting syrup is taken up in acetone, separated from any remaining insoluble matter, and boiled with activated charcoal, on the removal of which the solution is again reduced to about one-third of its volume, transferred to an open vessel and left uncovered at room temperature for 48 hours, during which time the protocatechuic acid crystallizes out in a crude form. The last traces of colouring matter are eliminated by the dissolution of the crystals in hot water and shaking with a suspension of freshly precipitated lead sulphide. After the removal of the lead sulphide and renewed concentration, the protocatechuic acid crystallizes out as pale yellow monoclinic needles, m.p. 199°.

The following amounts of pure protocatechuic acid were obtained by this method. A. Red varieties: fresh unbleached scales 0·08 to 0·125 gm. per 100 gm. scales; unpigmented portions from top and neck of bulb 0·01 to 0·03 gm.; partially bleached 0·07 to 0·10 gm.; badly bleached 0·02 to 0·06 gm. B. Yellow varieties: unbleached scales 0·08 to 0·135 gm.; unpigmented portions 0·00 to 0·02 gm.; partially bleached 0·05 to 0·08 gm.; badly bleached 0·00 to 0·03. The results of toxicity control experiments indicate that the maximum yield of protocatechuic acid hitherto obtained accounts for some 35 to 40 per cent. of the toxicity of the extracts from which the acid was isolated.

Jaczewski (A. A.) & Babayan (A. A.). О нахождении мильдью Винограда в Средней Азии. [Note on the discovery of Vine mildew in Central Asia.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 3–4, pp. 427–430, 1929.

In a brief note the junior author reports the discovery by him in 1928 of vine mildew (*Plasmopara viticola*) in the neighbourhood of Kara-Kala, Turkestan, this being the first record of the parasite in Central Asia. The small amount of the disease found renders

it improbable that it is of long standing in the locality, and points to its introduction from abroad, most probably from the Caucasus, where the mildew is already well established and causes severe damage in wet seasons. This communication is preceded by a brief historical outline by Jaczewski of the introduction of vine mildew into Europe and of its spread eastwards, with particular reference to its progress in Russia. Ecological conditions in Central Asia are considered to be such as to make it unlikely that the disease will ever be of great economic importance there.

De Gibon (J.). **Poudrages insecticides et anticryptogamiques en viticulture.** [Insecticidal and fungicidal dusts in viticulture.]—*La Vie Agric. et Rurale,* xviii, 42, pp. 251–253, 1929.

After a brief summary of the relative merits of dusts and liquid preparations for the control of vine diseases and pests, the writer enumerates a number of dusts for this purpose now on the market. Dusts used against mildew [*Plasmopara viticola*] alone include the copper steatites manufactured by Chefdebien, Arnal, Kuhlmann, Villedieu, Société des poudres cupriques (Béziers), Réno (Montpellier), Société Alsacienne (Paris), stéacuprol of the Comptoir Franco-Algérien (Marseilles), copper steatite (160 mesh) of Marty and Parazols, poudre Savès (Toulouse), microline of the Littorale (Béziers), and verdet [copper acetate] mixte Roca de Plazol (Lodève); poudre au lysol or pink lysolated dust (Ivry); and poudre des cryptolusines or sulphocalcic dust (Paris).

The following are sold for use against mildew and *Oidium* [*Uncinula necator*] combined: Copper sulphurs; Skawinski (Bordeaux), Tournissac, Raffineries internationales de soufre (Marseilles), sulphated sublimated flowers of sulphur (Raffineries de Soufre réunies, Marseilles), copper sulphur Baude, and copper sulphur Gré (Béziers).

Combined fungicides and insecticides include Schloesing nicodust, soufronol Germain, consisting of sulphur, salts of barium, copper, and manganese, formol, and aromatic compounds (Aix-en-Provence), and Aerola Simon Roche dust (Tours), composed of copper sulphur with nicotine and naphthaline. Talc is largely used as a 'filler' in the preparation of copper dusts. The best talc is obtained from Ariège [Pyrenees], that from the eastern Pyrenees and Aude being heavy and containing a large admixture of carbonate of lime.

Ivanoff (B.). Опити съ минералната сѣра Саймъ противъ Оидиума по Лозята. [Experiments with mineral sulphur Saim in the control of *Oidium* of the Vine.]—*Българско Овощарство* [*Bulgarian Fruit-Growing*], x, 9, pp. 172–173, 1929.

Comparative experiments which were made in 1929 in Varna [Bulgaria] in the control of the vine *Oidium* [*Uncinula necator*] with pure powdered sulphur and with the mineral sulphur Saim [*R.A.M.*, viii, p. 258] showed that the latter was entirely efficient and did not injure either the foliage or the grapes. Ordinary sulphur also checked the disease, but gave a fairly high percentage of scorched grapes.

ZACHAREWICZ (E.). **Traitement contre la brunissure de la Vigne.** [Treatment against the brown discoloration of the Vine.]—*Comptes rendus Acad. d'Agric. de France*, xv, 27, pp. 949–950, 1929.

Some years ago the writer obtained excellent results against the 'brunissure' disease of vines in Hérault (France) by the application to the soil of potassium sulphate at the rate of 100 gm. per stock [*R.A.M.*, v, p. 146]. Two years ago the disease (which is characterized by a brown spotting of the upper leaf surface, excluding the veins) developed on scions grafted on Rupestris du Lot stocks. The affected vines were pruned early in November and the wounds painted with a 30 per cent. solution of potassium nitrate. The disease was partially controlled and a good yield secured, while the untreated controls were severely affected.

PETHYBRIDGE (G. H.). **Fungus and allied diseases of crops 1925, 1926, and 1927.**—*Min. of Agric. and Fish. Misc. Publ.* 70, 75 pp., 4 figs., 1929.

This report on fungous, bacterial, and allied diseases of economic crops observed in England and Wales from 1925 to 1927, inclusive, is based chiefly on the monthly summaries and annual reports furnished to the Ministry of Agriculture and Fisheries by the mycological advisers in the various districts. It is compiled on the same lines as the preceding report [*R.A.M.*, v, p. 468] and contains, among others, the following new records. *Ascochyta brassicae* (stated to have been recorded previously in Northern Ireland) was found on cabbage in Devonshire in 1925; leaf spots of broad bean [*Vicia faba*] were caused in Devonshire by *A. fabae* and in Kent and Oxford by *Cercospora fabae* during 1927, but the resultant damage was not severe. *Bacterium delphinii* was present on delphinium seedlings in Buckinghamshire in 1926, and killed off adult plants near Reading the year following. On various occasions appreciable losses resulted from a storage rot of imported gladiolus corms caused by *Penicillium gladioli* [ibid., vii, p. 448]. A leaf spot of cucumber was reported from Cheshunt in 1926 as due to *Phyllosticta cucurbitacearum*.

The general situation during the period under review is briefly discussed with special reference to the prevailing weather, and notes are also given on investigations which are being conducted in various parts of England and Wales into the control of plant diseases. Throughout the report numerous references are made to recent literature dealing with the diseases concerned.

DORPH-PETERSEN (K.). **Beretning fra Statsfrøkontrollen for det 58 Arbejdsaar fra 1. Juli 1928 til 30. Juni 1929.** [Report of the State Seed Testing Service for the 58th year of activity from 1st July, 1928, to 30th June, 1929.]—*Tidsskr. for Planteavl*, xxxv, 5, pp. 809–854, 1929.

Section ix of this report (pp. 849–854) contains the following items of phytopathological interest. Sclerotia of *Claviceps purpurea* were found in 53 out of 195 samples of timothy seed [*Phleum pratense*], 20 out of 137 of rye grass [*Lolium perenne*], 16 out of 135 of meadow fescue [*Festuca pratensis*], and in all the 26

samples of creeping bent grass [*Agrostis stolonifera*] examined at the Danish Seed Testing Station during the year. They were also found in a few scattered samples of various other grass seeds as well as of oats and barley.

Sclerotia of *Sclerotinia trifoliorum* and *Typhula trifolii* [ibid., viii, p. 752] were found in scattered samples of red, white, and alsike clover. *Ustilago perennans* was present to a slight extent in 28 out of 106 samples of *Avena elatior*. Brome smut (*U. bromivora*) was found in 72 out of 131 samples of *Bromus arvensis*, and *Tilletia holci* in 28 out of 29 samples of soft grass [*Holcus lanatus*] seed.

PITTMAN (H. A.). **Report of the Plant Pathologist.**—*Ann. Rept. Dept. of Agric. Western Australia for the year ended 30th June, 1929*, pp. 27–29, 1929.

In this report notes are given on the investigations into bitter pit of apples [see below, p. 321] now in progress in Western Australia.

During the period under review the principal diseases recorded in Western Australia included *Ophiobolus graminis*, *Helminthosporium sativum*, and *Fusarium* sp. on wheat, pear scab (*Venturia pirina*), apple mildew (*Podosphaera leucotricha*), low temperature sour sap of stone fruits, citrus pit (*Pseudomonas citriputeale*), collar rot of oranges, court noué of the vine, which is becoming more prevalent, dry rot (? *Phoma lingam*) and false club root (? *Olpidium radicicolum*) of swedes, both of which are recorded for the first time in this region, *Ascochyta pisi* on peas, chocolate streak [? *Bacillus lathyri*] of broad beans [*Vicia faba*], and potato blight [*Phytophthora infestans*]; a virus mosaic was also recorded for the first time on garden nasturtium (*Tropaeolum majus*).

MARTYN (E. B.). **Botanical and Mycological Division. Annual Report, 1928.**—*Agric. Journ. Brit. Guiana*, ii, 4, pp. 222–224, 1929.

A wilt of coffee trees in the North-west District of British Guiana observed during the period under review was due, apparently, to physiological causes, no fungus being found associated with the condition. In the general appearance of the trees, and especially the fact that the shrivelled leaves did not fall, the condition resembled the symptoms ascribed in Surinam to phloem necrosis [*R.A.M.*, vii, p. 509]. In general, only isolated trees were affected, and attention to the drainage produced a marked and rapid improvement. *Cercospora coffeicola* caused slight spotting of coffee leaves and berries. A damping-off of citrus seedlings, associated with a species of *Fusarium*, resulted from inadequate drainage of the seed-beds.

HASKELL (R. J.). **United States of America: plant disease survey notes.**—*Internat. Bull. of Plant Protect.*, iii, 12, pp. 179–180, 1929.

During the last few years the cultivation of tomatoes has been almost abandoned in certain coastal sections of California on account of severe epidemics of die-back or tip blight [see above,

p. 275]. In 1929 the disease affected up to 50 per cent. of the crop, with an average of 10 per cent., even in the drier and warmer inland regions. The symptoms of die-back are somewhat reminiscent of streak, occurring in England and the eastern United States [*R.A.M.*, viii, p. 409] and spotted wilt, reported from Australia [ibid., vii, p. 410].

Celery yellows, caused by the aster yellows virus and transmitted by the leafhopper *Cicadula sexnotata* [ibid., viii, p. 553], is of some importance in California. The leafhopper has been present in the State for a long time, but the virus seems to be a recent introduction. An apparently identical disease was reported in October, 1929, from Maine.

Martin (W. H.). **Report of the Department of Plant Pathology.** —*Forty-ninth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1928*, pp. 241–253, 1928. [Received February, 1930.]

This report contains the usual observations on the distribution and prevalence of fungous diseases of plants in New Jersey during 1927–8 [cf. *R.A.M.*, viii, p. 22]. The following, *inter alia*, are of interest. In some sections of the State fruit spot (*Phoma pomi*) is the most serious disease of apples, causing 90 per cent. infection on apparently clean fruit three months after storage. Spraying with Bordeaux mixture gave good control in 1927.

Downy mildew of beans (*Phytophthora phaseoli*) [ibid., vii, p. 731] was very severe throughout the State.

Bacterial spot of pepper [*Capsicum annuum*] due to *Bacterium vesicatorium* [ibid., ix, p. 69] caused serious defoliation in Gloucester and Atlantic Counties.

Lehman (S. G.) & Poole (R. F.). **Research in botany. Division of Plant Pathology.**—*Fifty-first Ann. Rept. North Carolina Agric. Exper. Stat. for the fiscal year ended June 30, 1928*, pp. 59–67, 1929. [Received February, 1930.]

It has been ascertained that the causal organism of frog eye leaf spot of soy-beans (*Cercospora diazu*) [*R.A.M.*, vii, p. 760] may remain alive on diseased leaves until the next planting season. This occurs when the leaves are kept moist and yet sufficiently well protected to prevent extensive decay. On the other hand, the fungus appears unable to survive the disintegration of the leaves resulting from their contact with moist soil, so that the ploughing under of infected material is probably an effective method of controlling the disease. Seed treatment proved unavailing, the fungus apparently penetrating the seed coat and living internally from one season to the next. Some reduction of infection followed the use of two-year-old seed. Good control of downy mildew (*Peronospora manshurica*) [ibid., vi, p. 74] in the Herman and Laredo soy-bean varieties was obtained by seed treatment with semesan, uspulun, and mercuric chloride, the incidence of infection being reduced from 50 to between 1 and 10 per cent. The causal organism of the bacterial pustule disease of soy-beans (*Bacterium phaseoli* var. *sojense*) [ibid., vii, pp. 192, 496] was found to remain viable in diseased leaves stored in a dry place from

September till the following July. Plants inoculated with partially decayed leaf material placed out-of-doors in April also contracted the disease. The results of varietal tests showed that Columbia is practically immune from bacterial pustule, Laredo, Otootan, Tar Heel Black, and Easy Cook highly resistant, and Yokotan, Pine Dell Prolific, Virginia, Herman, Dixie, Hollybrook, Merko, Hoosier, and Midwest very susceptible.

Extremely encouraging results have been given by experiments in the control of sore shin of cotton (*Rhizoctonia*) [*Corticium solani*: ibid., v, p. 19 *et passim*] by seed treatment with mercuric chloride, copper carbonate, formaldehyde, and various mercury-phenol preparations, the average increase of stand in the treated rows amounting to 146 per cent.

Good control of leaf rust of wheat [*Puccinia triticina*] was given by dusting with sulphur once to three times a week [ibid., vii, p. 766]. It is considered probable that two applications, one about 30th April and the next about 7th May, are sufficient to ensure satisfactory results.

The chief cause of black rot in stored sweet potatoes was found to be *Ceratostomella fimbriata*; *Fusarium* spp., *Sclerotium bataticola* [*Macrophomina phaseoli*], and *Diplodia tubericola* [ibid., v, p. 598] were of minor importance, though sometimes responsible for heavy losses. The damage caused by storage rots was reduced by treatment with Bordeaux mixture 20–20–50. Infection of sweet potatoes by *F. batatatis* takes place through the open bundles during the natural removal of the sprout from the mother potato, and through injured areas on the stem. Small rootlets on the sides and ends of the potato were found to harbour the fungus. Cultural studies with *F. batatatis* indicate that poly-, mono-, and disaccharides are readily utilized in its growth. The readiness with which *F. batatatis* attacks dead organic matter may account for its longevity on many soils where crab grass [*Panicum sanguinale*] develops abundantly and is rarely decomposed in a season. Sweet potatoes grown in sandy soils proved more resistant to *F. batatatis* than those cultivated on heavy soils, this being apparently due to the fact that the former shrink less and are not so liable to cause injury. Good control of *F. batatatis* was obtained by the treatment of the roots and stems with 20–20–50 Bordeaux mixture or copper-lime dust (25–75). Scurf (*Monilochaetes infuscans*) was also well controlled by the copper-lime dust and Bordeaux mixture 10–10–50.

Notes are given on the treatment of the following dewberry [*Rubus* sp.] diseases; brown spot (*Cercospora rubi*), anthracnose [*Plectodiscella veneta*], stem girdling (*Mycosphaerella rubi*), cane blight (*Coniothyrium fuckelii*) [ibid., ix, p. 117], and root rot (*Collybia dryophila*) [ibid., vii, p. 384]. Of these, cane blight is the most important, causing 10 to 100 per cent. infection in the principal areas of dewberry cultivation.

Tucker (C. M.). **Report of the Plant Pathologist.**—*Rept. Porto Rico Agric. Exper. Stat. 1928*, pp. 29–35, 3 figs., 1929.

During the period under review a root disease in an orchard of Mexican and Guatemalan avocados, grafted on West Indian stocks,

was investigated. The affected trees were of all ages. The first symptoms were a cessation of growth and the development of a sickly yellow colour in the foliage, followed by gradual defoliation and death. Five of the six cultures made from roots of infected trees yielded a *Phytophthora* morphologically identical with that repeatedly isolated from trees showing a similar disease at the Station [*R.A.M.*, viii, p. 428]. The fungus closely resembles *P. cinnamomi* [ibid., ix, p. 136], being characterized by the production of grape-like clusters of chlamydospores and the absence, in ordinary cultures, of zoosporangia and oospores. Inoculation experiments on West Indian avocado seedlings grown in autoclaved soil showed the fungus to be capable of killing the roots. In most cases the effects of the parasite are rather slow. The disease is prevalent in heavy soils and poorly drained situations; infection occurs chiefly during the rainy season, but the symptoms are not always apparent until a few weeks after the beginning of the dry period, when the reduced root system can no longer supply the plants with sufficient moisture.

A species of *Phytophthora* caused heavy damage to young pepper [*Capsicum annuum*] plants in April, invading the tender stem tips and leaves and producing a black discoloration, shrinking, and collapse of the stems, on which a white efflorescence of sporangia appeared. Brownish-green, parchment-like spots of varying diameter also developed on the leaves, which fell prematurely. The mortality among the infected plants amounted to some 60 per cent.; recovery was unusual. The causal organism was isolated and inoculated into wounded pepper stems with positive results.

Fallen grapefruits which had lain on the soil for several days were attacked by a *Phytophthora*, differing morphologically from *P. citrophthora* and *P. hibernalis* [ibid., v, p. 296; ix, p. 105], which caused a leathery rot of the skin. After three days in a moist chamber the affected fruits were entirely invaded and covered with a white, cottony mycelial growth. A few chlamydospores were produced, but zoosporangia were rarely observed. The fungus does not appear to infect fruit on the trees and is probably a soil organism. Isolated cases of brown rot on Porto Rican fruit in the New York market are attributed to the export of fallen fruit or to contact between the fruit and moist soil.

The F_1 hybrids of crosses between the Duncan and Triumph grapefruit varieties proved to be equally susceptible to scab [*Sporotrichum citri*] with the susceptible parent (Duncan) [ibid., vii, p. 229]. About 3 acres of F_2 plants were obtained, and scab infection has appeared on the leaves and young stems, so that the elimination of susceptible individuals will be readily accomplished.

The pokkah-boeng disease of sugar-cane [associated with *Gibberella moniliformis*] was first observed at the Station in January, 1927, on a hybrid of P.O.J. 2725 with S.C. 12/4 [ibid., viii, p. 670]. The first symptoms of the disease are chlorotic spots on the unfurling leaves, usually near the base. In some cases a chlorotic wrinkled area may appear near the base of one leaf, about half way between the base and the tip in the next, and so on, the posi-

tion of the affected areas indicating that the wrinkling occurred while they were in close contact in the leaf spindle. The chlorotic areas usually develop red or reddish-brown spots or streaks soon after the leaf unrolls. The top rot characterizing affected canes in Java and Cuba and the ladder-like appearance caused in the former country by the crossing of dark bands with cavities and strands of reddish tissues have not been observed in Porto Rico. Pokkah boeng is most prevalent on the Java canes produced by crosses between P.O.J. 2364 and E.K. 28, and on crosses between the progeny of this hybrid and other varieties. Among the progeny of the P.O.J. 2364 and E.K. 28 cross the varieties P.O.J. 2725, 2714, 2878 (especially the last named), and others are susceptible, while crosses between P.O.J. 2725 and S.C. 12/4 are very liable to infection. So far the disease does not appear to have injured the canes to any appreciable extent or to have interfered with the normal growth of the ratoons. Two strains of *Fusarium* were isolated from the reddish tissue of the chlorotic areas, the organisms being present in approximately equal numbers in about 90 per cent. of the 200 platings examined. In no case did chlorotic areas devoid of reddish tissue yield a *Fusarium*. The results of inoculation experiments with these organisms showed them to be very weak parasites, capable of causing only insignificant lesions even when placed on the wounded central roll of young leaves and kept constantly wet. No trace of chlorotic spots developed. The inoculation of cuttings by injections of suspensions of the fungi failed to produce the disease in the daughter plants, or to affect the germination of the cuttings. Attempts to transmit the disease by planting cuttings from diseased stalks were also unsuccessful.

Brown (Nellie A.). **The tendency of the crown-gall organism to produce roots in conjunction with tumours.**—*Journ. Agric. Res.*, xxxix, 10, pp. 747–766, 10 pl., 1929.

The author states that long years of observation and investigation of the crown-gall organism (*Bacterium tumefaciens*), and more particularly of its apple strain, have led her to consider that both gall and infectious hairy root of apple are the same disease, which may manifest itself either by the production of tumours alone or of an abnormal proliferation of roots, or by a combination of both; in those cases where roots occurred in masses without a definite tumour she usually also observed the presence of inconspicuous swellings.

Cross-inoculation experiments with various strains of *Bact. tumefaciens* on a wide range of hosts showed that the strain isolated from natural hairy root of apple tree is slower to infect susceptible hosts, including the apple, than other strains of the organism, with the exception of the rose strain. On the apple, its general tendency is to produce roots, but it was also able to produce definite tumours or flat outgrowths covered, or partially covered, with root primordia. On the Paris daisy (*Chrysanthemum frutescens*) and *Impatiens balsamina* it reacted by the production of masses of roots and small tumours, on rose and bean stems by the production of definite tumours without roots, and on *Bryophyllum pinnatum* by the

formation of clumps of roots or of tumours devoid of roots. On tobacco, geranium, and castor it only gave rise to a few inconspicuous outgrowths without roots in two to four months, while the results on tomatoes were negative.

When freshly isolated from its natural host, the apple strain differs from other strains (the rose strain excepted) in some cultural characters, e. g., its slower growth and its lesser translucency on beef and Thaxter agar. These differences disappeared, however, when the apple strain was passed through another host, and re-isolated, after which it also appeared to have increased in virulence, since the new cultures produced infection in less time than the original ones.

The ability to produce roots is not limited to the apple strain of *Bact. tumefaciens*, since it was shown that the peach, hop, poplar, chrysanthemum, and some other strains can also cause the formation of roots.

MENCACCI (M.). **Alcune ricerche sulle ruggini del Frumento in agro Romano.** [Researches on Wheat rusts in the vicinity of Rome.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 3, pp. 305–320, 1929.

Investigations [full details of which are given] conducted during 1926 in the vicinity of Rome, with six [named] varieties of wheat of known rust reaction, to ascertain the duration of the germinative power of the uredospores of *Puccinia* spp. in the field and laboratory gave the following results.

Uredospores of *P. triticina* from April infections placed indoors lived 15 to 18 days when taken from susceptible wheats and 22 to 25 days when taken from resistant varieties; left on the plants they lived 23 to 26 days in the former group and were still germinating on the 49th day in the latter. Taken from May infections on susceptible wheats and kept indoors, they began to germinate on the 8th day and ceased on the 22nd; those from resistant wheats ceased germination on the 25th day. When left on the plants they were still living on the 38th day, the percentage of germination being low on susceptible varieties and high on the resistant Rieti. Taken from June infections and kept indoors, the uredospores of *P. triticina* germinated on the 8th day and ceased to do so between the 22nd and the 28th, this date depending upon whether they were obtained from susceptible or resistant wheats.

Uredospores of *P. graminis* from June infections kept indoors began germination on the 3rd or 4th day and ceased on the 21st, while those of *P. glumarum*, also taken from June infections, when placed indoors ceased germination on the 22nd day.

The uredospores of all these rusts when left on the plants in the field gave low germination percentages in hanging-drop cultures until the middle of September, after which they became completely inactive; the highest rates of germination were obtained from *P. triticina* and *P. glumarum* taken from the resistant Carlotta Strampelli and Rieti varieties.

The uredospores of *P. glumarum* found between the glumes retained their germinative power until November, but when then inoculated on young plants gave negative results.

Wheats for transplanting sown early in September became rusted, presumably owing to still living uredospores from the previous infection in June; in November, moreover, the uredospores of *P. triticina* from these plants inoculated on young wheat plants still reproduced rust.

The uredospores of *P. triticina* were present throughout the winter, though pustules were not numerous, in all those fields where conditions were favourable to infection; in the following spring infection was very severe.

These observations are considered to confirm the view that the overwintering of *P. triticina* may take place by means of autumn and winter infections by the uredospores [cf. *R.A.M.*, viii, p. 762].

Tests were conducted in the same fields to determine the effect of the date of sowing upon the rusts [ibid., viii, p. 93], three plots each of Gentil rosso 48 and 58, Rieti, Ardito, and Mentana being sown on 28th October, 26th November, and 22nd December, 1927, respectively. All the plots received identical manurial and other treatment. During the autumn and winter no rust appeared, although in the previous winter a few of the uredospores of *P. triticina* had constantly been present. On 10th April the first rust pustules appeared on the October-sown plots of Gentil rosso and Mentana wheats; these were a few uredosori of *P. triticina*, and they were present only on the western side of the plot. No pustules were noted on the Rieti and Ardito varieties. Towards the end of April infection became intensified on all varieties, but especially on Gentil rosso, the earliest-sown plot being that most affected. In all the varieties the December plots were attacked last.

Up to 25th May there was no appreciable difference in the intensity of infection on any one variety sown at the three dates. By the end of May and the beginning of June, however, the difference became very marked, the plots sown last, especially those of Gentil rosso wheat, showing greatly increased infection. *P. triticina* at first was most severe on the plots sown earliest, then it appeared to affect all the plots equally, and finally (between 25th May and 10th June) it was most severe on the plots sown last. This is considered to confirm the view [loc. cit.] that, weather conditions apart, rusts become more prevalent when the host reaches a particular stage of development.

At the end of May *P. graminis* began to appear on all the plots, causing most damage on those sown last, where the late varieties remained green until 15th June. In the December plots of Gentil rosso, Mentana, and Ardito wheats the damage caused by this rust was very severe, especially on the culms, though the leaves and ears were not much affected. The October-sown plots of these varieties, being much further developed, suffered considerably less.

Infections by *P. glumarum* began between 10th and 13th June, first on Ardito and immediately after on both Gentil rosso varieties. In the December-sown plots of the latter, and to a less extent of Ardito and Mentana, the inflorescences were severely constricted by *P. glumarum*; the November plots were also badly damaged, but in the October plots the inflorescences remained

normal, as *P. glumarum* was light on the Gentil rosso varieties in these plots and was not found at all on Ardito and Mentana in them. On the December plots of Rieti wheat *P. glumarum* was sparse and there was no constriction of the inflorescences.

The author considers that *P. glumarum* reduces the yield more than either *P. triticina* or *P. graminis*, especially when the crop is sown late, plants the ears of which had ripened before *P. glumarum* became very prevalent giving much better yields than those whose ears were still green. Leaf infections by *P. triticina*, while dangerous, develop, under Italian conditions, during the vegetative growth of the plant when it can still put out new leaves. Infections of the culm by *P. graminis* are more serious, as they produce deep lesions in the stem and may weaken the whole plant. Growers state that rusts do not affect the yield unless constriction of the inflorescence occurs. In fields near Rome, sown at the end of February with Rieti and early in March with Ardito and Mentana, pustules of the various rusts covered the wheat, but whereas Rieti was almost unaffected by *P. glumarum* and gave a good yield, Ardito and Mentana showed this rust on the ears, and the inflorescences were so constricted and covered with spores that the wheat could not be harvested.

These results agree in the main with Brega's observations made near Pavia [loc. cit.], except that they do not support his statement that attacks of *P. glumarum* occur earlier and more commonly than those of *P. triticina*.

A useful bibliography is appended.

HART (HELEN). **Relation of stomatal behaviour to stem-rust resistance in Wheat.**—*Journ. Agric. Res.*, xxxix, 12, pp. 929–948, 1 fig., 2 graphs, 1929.

The author gives details of field and nursery studies at St. Paul, Minnesota, to elucidate the reasons of the variations observed in the resistance of certain varieties of wheat to stem rust (*Puccinia graminis tritici*) in greenhouse infection experiments and in the field, and also at different stages of their development. The results indicate the existence, besides physiological and morphological resistance, of a third kind of resistance which is termed 'functional', and which is in a great measure dependent on the behaviour of the stomata in different wheat varieties.

The stomatal movements in all wheats follow a definite daily rhythm, but in some varieties the stomata open very soon after sunrise and usually remain open most of the day, while in others they open very slowly and remain open only a short time; an intermediate type of stomatal behaviour was also observed. Differences were found in the stomatal movements of wheat plants in varying ages, and in different organs. The chief stimulus for their opening appears to be direct sunlight, while artificial light, excess of moisture and temperature, either alone or in combination with each other, did not prolong the time during which the stomata remained open in the greenhouse.

Since inoculation experiments and histological studies indicated that the germ-tubes usually, if not always, enter the host tissues

through open stomata and are not able to penetrate closed ones, it is inferred that a variety of wheat may appear truly resistant to stem rust in the field if its stomata remain closed or are open only as a very narrow slit during the critical period for stem rust infection in the early morning immediately after sunrise, while the plants are still covered with abundant dew. This assumption was confirmed by the correlation which was observed between stomatal behaviour and rust resistance in a wide range of varieties tested in the field and rust nursery. The stomata of highly susceptible varieties, e. g., Little Club, Early Baart, Quality, and Reward, were found to open soon after sunrise and to continue so most of the day, while those of highly resistant varieties in the field, e. g., Hope, Webster, Acme, and Velvet Don, open very slowly and close again relatively soon. Varieties such as Kota and Kubanka, which are moderately resistant in the field, exhibited an intermediate type of stomatal behaviour.

STEWART (G.). **Stem-rust-resistant segregates from Wheat crosses between two susceptible parents.**—*Phytopath.*, xix, 12, pp. 1129–1130, 1929.

Continuing his investigations at the Utah Agricultural Experiment Station, on the inheritance of resistance to stem rust [*Puccinia graminis*] in the segregates from crosses between a susceptible variety of wheat (Federation) and a partly susceptible or semi-resistant one (Sevier No. 59) [*R.A.M.*, vii, p. 497], the writer obtained a second fully resistant segregate (R) in 1928. The rust tests were carried out at St. Paul, Minnesota. Of the 26 strains tested in the F_5 generation, 12 were homozygous for full susceptibility (S), 7 were homozygous for semi-resistance (SR), and one for complete resistance (R), while 6 were still segregating. The Federation parent was again completely susceptible (60 S) and Sevier No. 59 semi-resistant (50 SR).

All the segregates studied were susceptible to leaf rust [*P. triticina*: ibid., vii, p. 79]. The segregate resistant to stem rust was highly susceptible to leaf rust (90 S).

LEIGHTY (C. E.). **Breeding Wheat for disease resistance.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, i, pp. 149–153, 1929.

In this paper the author summarizes the results of the investigations conducted by him and his collaborators in various parts of the United States into the breeding of wheat varieties resistant to leaf rust (*Puccinia triticina*), an account of which has already been noticed from another source [*R.A.M.*, v, p. 725]. He concludes that there is hope of obtaining by the hybridization of resistant parents, strains of wheat resistant to all forms of *P. triticina*. At the time of writing it appears that strains resistant to 9 of the 12 known forms of leaf rust have been obtained, Malakoff being resistant to 6 forms and C.I. 3778 to 3 others, to which Malakoff is susceptible.

Howitt (J. E.) & Stone (R. E.). **Grain smuts.**—*Ontario Dept. of Agric. Bull.* 349, 18 pp., 18 figs., 1929.

Popular notes are given on the life-histories, symptoms, and control of the following cereal smuts in Ontario: loose and covered smut of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]), of which the former is the commonest and most troublesome of this group of fungous diseases under local conditions, causing (together with covered smut) an estimated annual loss of $2,500,000; bunt (*Tilletia levis* and *T. tritici*) [*T. foetens* and *T. caries*] and loose smut (*U. tritici*) of wheat; loose and covered smut of barley (*U. nuda* and *U. hordei*); and maize smut (*U. zeae*). The control measures recommended include spraying or sprinkling with formalin, dusting with copper carbonate, and the hot water treatment (the latter for the loose smuts). Directions are also given for the construction of a simple dusting apparatus.

Rupp. **Die Organisation der Saatgutbeizung in Hessen.** [The organization of seed-grain disinfection in Hessen.]—*Nachricht. über Schädlingsbekämpf.*, iv, 4, pp. 117–120, 1929.

Particulars are given concerning the organization of seed-grain disinfection in Hessen (Germany), which was commenced on co-operative lines in the autumn of 1928. Suitable individuals were selected in each community to receive instructions in the etiology and control of the principal fungous diseases, and the work was then conducted under their supervision. The treatment was carried out chiefly with the Globus and Puk apparatus, but the Primus and Lothrä machines were also included in some of the tests for comparative purposes [*R.A.M.*, viii, pp. 95, 559]. Tillantin dust was supplied at a reduced price, so that the cost to the farmer of treating 1 cwt. of seed-grain (using 150 gm. of the dust) was Pf. 50 (including Pf. 10 for the supervisor). The results of the work were very encouraging and the operations are to be continued on similar lines. In addition to tillantin, which is effective against snow mould (*Fusarium*) of rye [*Calonectria graminicola*], wheat bunt [*Tilletia caries* and *T. foetens*], and stripe disease of barley [*Helminthosporium gramineum*], ceresan [ibid., ix, pp. 27, 101] gave good control of loose smut of oats [*Ustilago avenae*] and stripe disease of barley in one experiment. It is estimated that some 29 per cent. of the winter cereals and 15 per cent. of the summer ones were treated under the co-operative system. A further subsidy from the Ministry of Labour will enable the 1929 operations to be carried out at a total cost of Pf. 45 per cwt.

Mackie (W. W.). **Resistance to Septoria tritici in Wheat.**—Abs. in *Phytopath.*, xix, 12, pp. 1139–1140, 1929.

Speckled blotch of wheat, caused by *Septoria tritici* [*R.A.M.*, viii, pp. 21, 638], is common in northern California and occurs throughout the State in wet seasons, being particularly prevalent in the late spring. The pycnospores in the old pycnidia survive on the diseased straw and are disseminated by wind and rain among the young wheat seedlings. The completion of a generation from spore to spore requires 12 to 15 days. Young seedlings are severely attacked and many killed. Under favourable conditions the disease

persists until the dough stage of the ears, causing weakening and lodging of the plants and shrivelling of the grain. No immune varieties were found among the many hundreds tested in the common bread wheats (*Triticum vulgare*) group, though there were many in other species. *Septoria*-free plants were produced by repeatedly crossing the most resistant selections of hybrid stocks. These in turn were crossed with susceptible plants and gave, in the F_3 generation, a ratio of approximately 3 : 1 of susceptible and resistant plants.

Wölfer. **Rostübertragung von Wintergerste auf Sommergerste.** [Rust transmission from winter to summer Barley.]—*Illus. Landw. Zeit.*, xlix, 49, p. 574, 1929.

According to observations made in the Sonderburg district of northern Slesvig (Germany), the Binder and Opal varieties of summer barley have been heavily damaged by yellow rust [*Puccinia glumarum*], which is believed to have spread from the winter crop. Danish experts from Copenhagen have inspected the affected fields and advised the abandonment of the relatively unprofitable winter crop. In the southern parts of the province, however, the winter crop is more lucrative than the summer one, and the writer suggests varietal trials before acting upon the Danish recommendations.

Mackie (W. W.). **Inheritance of resistance to Barley scald.**—Abs. in *Phytopath.*, xix, 12, p. 1141, 1929.

The repeated crossing of barley varieties highly resistant to scald (*Rhynchosporium secalis*) [*R.A.M.*, viii, p. 639] led to the production of highly resistant and immune plants under heavy attack. By crossing immune with highly susceptible plants the following Mendelian ratios were secured for 523 F_3 families at Davis [California]: homozygous resistant 126, heterozygous susceptible and homozygous susceptible 397, indicating a 3 : 1 ratio of susceptibility to resistance due to a single factor for resistance, this quality being recessive.

Garber (R. J.), Giddings (N. J.), & Hoover (M. M.). **Transgressive segregation for susceptibility to smut in an Oat cross.**—*Journ. Agric. Res.*, xxxix, 12, pp. 953–962, 1929.

A study in 1928 of the F_5 generation of the cross between Gopher and Black Mesdag oats which was described in a previous paper [*R.A.M.*, viii, p. 167] again confirmed the view that Black Mesdag carries a dominant factor for resistance to smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]), which gives high resistance, if not actual immunity, to the cross. There was evidence, however, that there is also a modifying factor or group of factors which acts as an inhibitor to the former, and results in transgressive segregation for susceptibility to smut, since certain lines of the F_5 generation distinctly showed greater susceptibility than the susceptible Gopher parent. Evidence was also obtained of a linkage between the black colour gene of the seed and the above-mentioned modifying factor or group of factors.

Lehman (S. G.) & Fant (G. W.). **Control of Oat smut by seed treatment.**—*North Carolina Agric. Exper. Stat. Bull.* 268, 15 pp., 6 figs. (1 on cover), 1929.

During the past two seasons tests have been conducted in North Carolina for the control of loose smut of oats (*Ustilago avenae*). The results [which are discussed and tabulated] showed that smuttox (a commercial dust containing formaldehyde), P–M–A (a dust containing organic mercury), and mercuric chloride dust (prepared by grinding powdered mercuric chloride in a ball mill), applied at the rate of 3 oz. per bushel, gave excellent control of the disease. Ceresan [see above, p. 297] was also effective, though slightly less so than the foregoing, while copper carbonate and copper sulphate failed to give practical control. A mixture of mercuric chloride and copper carbonate or copper sulphate (2 : 1) was much more effective than either of the two copper preparations alone. Sprinkling with formaldehyde (1 pint to 1 pint water) completely eliminated smut but caused a serious reduction of germination, a drawback attaching also to the mercuric chloride dust, alone or in combination with the copper preparations. Little or no injury, however, was caused by ceresan, P–M–A, and smuttox. The average increase of yield obtained by treatment with ceresan and formaldehyde was 60 and 51·1 per cent., respectively. The estimated cost of dusting is 8 to 12 cents per bushel, or 16 to 24 cents per acre.

Holbert (J. R.) & Dickson (J. G.). **The development of disease-resistant strains of Corn.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, i, pp. 155–160, 2 pl., 1929.

Discussing their investigations made to determine the reaction of numerous inbred strains of maize to pure-culture inoculations with various disease-producing organisms, chiefly *Diplodia zeae* and *Gibberella saubinetii* [cf. *R.A.M.*, v, p. 545], the authors state that inbreds have been isolated showing a wide range in resistance and susceptibility to each of the organisms used. In 5 of the inbred families grown during 9 or 10 years there was a marked improvement in disease resistance and general vigour, due partly to the elimination of the inferior material following plantings in cold soil and maize-sick soil and by inoculation experiments. A first generation cross between two vigorous inbreds yielded approximately 20 per cent. more sound maize than the parents; it matured about 10 days earlier, stood up well, and was highly resistant to ear rots.

Some strains of inbreds have a low, and others an intermediate or high temperature of optimum growth. The root systems of inbreds and their recombinations obtained by crossing differ significantly in character and extent. The proportion of tops to roots varies greatly in inbred strains, variation also occurring in resistance to stalk breaking, and economy of plant food and light.

The authors consider that the greatest and most rapid improvement will be met in selfing, selecting, and recombining varieties already standardized commercially in the different regions, rather than in introducing entirely new synthetic varieties.

BRESSMAN (E. N.). **The effect of land plaster applied as a dust on seed Corn.**—*Phytopath.*, xix, 12, pp. 1131–1133, 2 figs., 1929.

Good control of various [unspecified] moulds that impair germination or injure the seedlings, and also stimulation of growth, resulted from the treatment of Minnesota No. 13 seed maize with land plaster (powdered gypsum) at the rate of 8 lb. per acre at Corvallis, Oregon. The seed thus treated gave higher yields than resulted from any of the disinfectant dusts used in the trials. Slightly increased yields followed the use of copper carbonate, semesan jr., and uspulun, while Bayer's dust, höchst [tillantin] dust, Bayer's compound, and Bayer's Spec. No. 169 caused a decrease. In additional trials no injury to the seed was caused by land plaster at the rates of 1 to 50 lb. per acre. The gypsum should be applied with the aid of a fertilizer attachment on the maize planter, bringing the dust into contact with the seed in the soil, as it does not adhere readily to the seed.

SHEPHERD (E. F. S.). **Maize chlorosis. Notes on chlorosis of Maize and other Gramineae in Mauritius.**—*Trop. Agriculture*, vi, 11, p. 320, 1929.

The author states that, in his opinion, the chlorosis of maize which occurs in Mauritius and which he first thought to be mosaic [*R.A.M.*, iv, p. 313], but after sending specimens to Dr. Storey to be streak [ibid., v, p. 56], is really identical with the stripe disease described by Stahl from Cuba [ibid., vii, p. 159]. The reputed streak disease of sugar-cane in Mauritius may also possibly be stripe, and if this should be substantiated it would explain the freedom of the Uba cane from infection in that island. A final conclusion on the matter, however, can only be reached when either of the insect vectors of stripe or streak disease (*Peregrinus maidis* and *Balclutha* [*Cicadulina*] *mbila*, respectively) is found, as neither has so far been recorded in Mauritius.

The maize disease recorded originally as mosaic in Reunion in 1924 [ibid., iv, p. 313] but subsequently as streak [ibid., v, p. 695] is still regarded as the latter disease.

PETRI (L.). **Batteriosi dei rametti e mal del secco dei Limoni in Sicilia.** [Bacteriosis of the twigs and 'mal secco' disease of Lemons in Sicily.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 3, pp. 282–290, 1 fig., 1929.

The 'mal secco' disease of lemons in Sicily [*R.A.M.*, viii, p. 547] is considered to be a tracheomycosis or hadromycosis [ibid., vii, p. 179], the external symptoms on the twig tips resembling those of anthracnose. The similar wither-tip of citrus present in America is caused by *Gloeosporium limetticolum* or *Colletotrichum gloeosporioides* [*Glomerella cingulata*], but whereas the former organism has not been found in Sicily, the latter has become astonishingly prevalent in groves in the provinces of Messina and Catania where forcing is practised; only lemons are affected.

The most striking symptom of mal secco is a rose or orange discoloration of the woody tissue due to the presence of a mycelium, and macroscopically visible on the cut surface of an affected branch

directly it shows the first symptoms. The fungus remains localized in the woody tissues, while the cambium and cortex may remain living and green for a comparatively long period if the hyphae in the vessels are few and restricted to a small sector of the woody cylinder. When, however, the toxic products of the fungus spread to the peripheral tissues and leaves, the result is the yellowing of the cortex on one side and the yellowing and shedding of the leaves.

The mycelium rapidly passes from the young shoots to the secondary branches and eventually to the trunk. The latter may, however, live for several years, as infection does not readily spread transversely, and hence a sector can long continue to function normally; from it, if the roots are vigorous, robust shoots may develop, only in their turn to become infected from without.

After the leaves fall, the shoots gradually wither or, more often, develop a total or partial necrosis of the cortex, which in the latter case is confined to longitudinal strips. This marks the beginning of the anthracnose stage of the disease, with the subsequent development of the acervuli of *C. gloeosporioides*. Some resemblance between mal secco and blast [*Pseudomonas citriputeale*: ibid., vii, p. 628] in certain external characters may be found in these manifestations of anthracnose on the shoots before the fungus fructifies.

Recent isolations of the fungus present in the woody tissues in twigs before the symptoms of anthracnose appear have yielded an organism distinct from *C. gloeosporioides*. The mycelium was at first white but later partly dark and partly olivaceous-grey. A striking differential character was seen on solid neutral or alkaline media rich in glucose, on which the mycelium showed a reddish-carmine colour very different from that present in the cultures of *C. gloeosporioides*. A slight diffusion of colour slowly took place in the agar, where agglomerations of ruby-red, needle-shaped crystals formed. The secretion of this pigment produces the characteristic orange colour of the gummy content in the wood vessels associated with the presence of mycelium in them.

When the two fungi were grown together in the same culture tube *C. gloeosporioides* generally outgrew the other, a fact which explains why in many isolations from infected lemon twigs the former was the only fungus obtained.

On the usual nutritive media two forms of conidial fructification developed from the mycelium in the vessels, one being similar to that of *Acremonium*. but accompanied by the formation of a few cylindriform conidia measuring 4 to 6 by 1·5 to 3 μ, while the other consisted of dark micropycnidia with conidiophores not of the common basal type but polyhedric and united in groups which on attaining maturity were released into the pycnidial cavity. The cylindrical conidia, measuring 2·3 to 5 by 0·8 to 2 μ, were formed on the free surface of these fertile cells.

Mal secco has not yet been reproduced experimentally in Sicily even as a result of direct contact between the tissues of healthy and diseased twigs. This accords with what occurs in nature where infection is sporadic and attacks only specially susceptible trees.

PETRI (L.). **I metodi di cura del marciume radicale degli Agrumi.** [Methods for the control of root rot of Citrus.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 3, pp. 255–272, 4 figs., 1929.

After pointing out that root rot of citrus [*R.A.M.*, vii, p. 557], which continues to cause serious losses in Sicily, may be associated, when resulting from insufficient aeration of the soil, with numerous fungi, since *Armillaria mellea*, *Sclerotinia libertiana* [*S. sclerotiorum*], *Rosellinia pepo*, *R. bunodes*, and various species of *Fusarium*, especially *F. limonis*, have been recorded [in various countries] to infect citrus roots, or that no pathogen at all may be present, the author states that the commonest forms of the disease in Sicily, even under the best cultural conditions, are caused by *Phytophthora citrophthora* and *P. parasitica*. The chief external symptom of infection by *P. citrophthora* [ibid., viii, p. 640] is gum exudation through cracks in the bark at the base of the trunk. Root rot caused by *P. parasitica* and not associated with gummosis is, however, the more prevalent form. Both species of *Phytophthora* are able to live saprophytically on the ground or on fallen fruits.

To prevent *Phytophthora* infection excessive soil moisture should be avoided by draining, and manurial dressings should be moderate; nitrogenous dressing, whether organic or mineral, should be counterbalanced by applications of phosphates and potassium. Lime deficiency should be rectified. All fallen fruits must be removed, and in order that the collar may be well aerated and not remain too long in contact with irrigation water or wet soil, the earth should be removed at the base of the trunk and piled into a small encircling mound. Great care should be taken during this operation to avoid wounding the roots, as this predisposes to infection by *P. parasitica*. During spring and summer the surface of the ditch so made should be given one or two applications of 2 per cent. Bordeaux mixture or Caffaro powder, as should the stem to a height of 1 m. from the ground. Other crops should not be grown in the same orchard as they require frequent watering and nitrogenous soil dressings.

A cure may be effected, provided the disease is not far advanced and the methods recommended are diligently applied. These consist in laying bare the affected roots, pruning, removing all dead and diseased roots, cutting away the necrosed parts of the collar and stem to the healthy tissue, and disinfecting the surface with a 25 to 30 per cent. solution of ferrous sulphate or a 2 to 4 per cent. solution of copper sulphate and lime; after drying, the wounds should be painted over with pitch or carbolineum or some similar paste. The ditch at the base of the tree should then be filled in with earth from the surface of the orchard, and fertilizing and light watering resumed.

If it is required to plant a new tree where an adult one has succumbed to root rot, the old roots must be removed and the cavity left open for at least a year, 2 per cent. Bordeaux mixture, 5 per cent. solution of formalin, or quicklime being added.

Evidence is appended, obtained from numerous orchards, confirming the efficacy of these methods.

Klotz (L. J.) & Fawcett (H. S.). **The relative resistance of varieties and species of Citrus to bark diseases.**—Abs. in *Phytopath.*, xix, 12, p. 1136, 1929.

In a series of inoculation experiments with *Phytophthora citrophthora* [see preceding abstract] on 78 varieties and species of citrus, all varieties and strains of lemon proved very susceptible. Sour oranges [*Citrus aurantium* or *C. bigaradia*] and two varieties of citron [*C. medica*] were very resistant. Grapefruit and sweet oranges varied considerably in their reaction to the fungus, some varieties approaching sour oranges in resistance while others were nearly as susceptible as lemons. Tangerines [*C. nobilis* var. *deliciosa*] were much less resistant than grapefruit and sweet oranges, their reaction being similar to that of rough lemons and limes. The Sanford, Savage, and Cunningham varieties of citrange [*C. sinensis* × *Poncirus trifoliata*] proved resistant.

Sibilia (C.). **Alcuni parassiti dei frutti di Limone.** [Some parasites of Lemon fruits.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 3, pp. 292–297, 1929.

In this paper an account is given in popular terms of injuries to Italian lemons caused by various fungi, reference to some of which has already been made from another source [*R.A.M.*, viii, p. 547].

From a reddish-brown lesion in the skin of a lemon from Pistoia the author isolated *Septoria citri* var. *minor*, the elongated, hyaline spores of which measured 10 to 12 μ in length; in culture on naturally acid carrot agar the spores often attained a length of 19 to 24 by 1·3 to 2 μ broad. *Alternaria citri* was found in large brown spots on Messina lemons, infection reaching the pulp after passing through the mature rind. A type of injury resembling anthracnose was caused by a species of *Gloeosporium*, while one fruit was attacked by a number of fungi, including *Cladosporium citri* (*Sphaceloma fawcettii*) [cf. ibid., iv, p. 476].

Sicilian growers recognize two forms of a condition locally known as 'petecchia' or rash, which resembles peteca [ibid., ix, p. 238]; these conditions differ in the mode and point of attack but are both characterized by circular light brown indentations in the skin. A bacterium, considered to be probably *Phytomonas* [*Pseudomonas*] *citriputeale*, was present in some of the affected parts.

Marloth (R. H.). **Hydrogen-ion concentration studies on Penicillium italicum and P. digitatum.**—Abs. in *Phytopath.*, xix, 12, p. 1142, 1929.

Penicillium digitatum and *P. italicum*, causing moulds on citrus fruits [*R.A.M.*, viii, p. 378], were grown on a number of media containing sucrose, in the utilization of which the fungi produced oxalic acid owing to an incomplete respiratory process. The P_H of the medium was consequently lowered. A small percentage of the spores of *P. italicum* germinated at P_H 1·9, while those of *P. digitatum* did not germinate below P_H 2·3. The optimum range for the former organism, on modified Duggar's solution, was P_H 3 to 7 and for the latter P_H 3·5 to 8.

The optimum growth range for *P. italicum* was found to be

P_H 2·5 to 6·7 and for *P. digitatum* 3 to 5·5. There is thus a marked physiological difference between these two fungi, which are morphologically so closely related.

Klotz (L. J.). **Further studies on Penicillia of Citrus.**—Abs. in *Phytopath.*, xix, 12, p. 1144, 1929.

No microscopic differences in the mode of infection by *Penicillium digitatum* and *P. italicum* have so far been revealed by a histological study of diseased citrus tissues. The hyphae are intra- and intercellular and penetrate all the cells of the albedo, flavedo, core, and oil glands. In advanced stages of the rot, the juice vesicles become involved. Diastase production by *P. italicum* was found to increase with rising temperature up to 32° C., the maximum for growth.

Bondartzeff (A.). О заболеваниях Лимонов, наблюдаемых при неправильном хранении. [Note on diseases of Lemons observed under faulty storage conditions.]—*Morbi Plantarum*, Leningrad, xviii, 3, pp. 168–171, 1929. [German summary.]

The author gives a brief description of the damage done to a large consignment of lemons from Italy which was received in December, 1928, at Sebastopol, by defective storage conditions during the winter. When the lemons were received in Leningrad in the spring of the following year, 15 to 20 per cent. were found to be affected with the diseases known in America as red blotch and peteca [*R.A.M.*, ix, p. 238]. Although these diseases do not by themselves cause a rot of the lemons, they prepare the way for secondary organisms, and are thus held responsible for the considerable number of rotting lemons that were also found in the consignment.

Fawcett (H. S.) & Shear (C. L.). **Discovery of the perfect stage of a Phomopsis on Lemon bark.**—Abs. in *Phytopath.*, xix, 12, p. 1138, 1929.

A *Diaporthe* found in March, 1928, on the bark of lemon trees affected by decorticosis [shell bark: *R.A.M.*, v, p. 20] at North Whittier Heights, California, was shown by pure culture tests and inoculations to be the perfect stage of *Phomopsis californica*, previously described as the causal agent of this condition as well as of stem-end rot of lemon fruits [ibid., vii, p. 714]. The perithecia are embedded in the surface layers of the dead flakes or scales of bark.

Saavedra (E. F.). **Es alarmante la propagación de la podredumbre del Cogollo en Puerto Rico.** [The spread of Coconut bud rot in Porto Rico is alarming.]—*Rev. Agric. Puerto Rico*, xxiv, 6, pp. 220, 256, 1929.

Much concern is stated to prevail in Porto Rico on account of the ravages of bud rot of coco-nuts [*Phytophthora palmivora*: [*R.A.M.*, viii, pp. 428, 564], the incidence of which is steadily increasing in the west of the island. The value of the crop is shown by the quantities of nuts exported annually to the United States (23,088,000, worth $697,972 in 1927–8).

STANER (P.). **Les ennemis de l'Elaeis.** [The enemies of *Elaeis*.] —*Agric. et Élevage au Congo Belge*, iii, 26, pp. 405–407, 3 figs., 1929.

In this account of the principal diseases of oil palms (*Elaeis* [*guineensis*]) in the Belgian Congo the author states that the leaves are sometimes attacked by *Sphaerella elaeidis*, an *Amphisphaeria*, and a *Colletotrichum*, the two former producing greyish spots while the last-named causes a characteristic zonation of concentric, brown and grey transversal bands on the leaflets, black fructifications being visible in all these lesions. Small brown, later greyish-green, superficial spots on the leaves are caused by *Cephaleuros virescens* [*C. mycoidea*]. The hollow trunk disease due to *Ganoderma applanatum* [*R.A.M.*, v, p. 150] is prevalent on adult palms; opposite the point of insertion of the sporophores, near the base of the trunk, a cavity extends through one-third or one-half of the heart of the palm and is filled with woody detritus and whitish mycelium. Frequently only fallen trees show the sporophores. Over-ripe fruits are affected by a *Phytophthora* and a *Fusarium*.

MULLER (H. R. A.). **Voorloopige mededeeling over een schimmel, geïsoleerd uit instervende Koffieboomen in Zuid-Sumatra.** [Preliminary note on a fungus isolated from Coffee trees affected by die-back in south Sumatra.]—*Arch. voor Koffiecult. Nederl.-Indië*, iii, 3, pp. 167–181, 7 figs., 1929. [English summary.]

Details are given of the writer's experiments in the isolation of a fungus from coffee (*Coffea robusta* and *C. excelsa*) trees affected by the type of die-back in southern Sumatra, first reported in 1925 [*R.A.M.*, v, p. 475] as a disease of the older bushes of these two varieties. Pieces of the stems and branches of the material for investigation were sealed with paraffin in order to prevent the destruction of the fungi in the wood vessels by the disinfectant (2 per cent. corrosive sublimate) used for surface sterilization (10 to 20 minutes' immersion). After washing with sterile water the bark was removed by means of a sterile scalpel, and freehand sections of the wood were placed on a thin layer of prune decoction agar in Petri dishes. By microscopic examination of the cultures through the bottom of the dishes it was possible to ascertain whether a fungus was growing from the tracheae, in which case transfers were made to prune decoction agar slants. The organism was also isolated from coffee trees suffering from the so-called 'top die-back' of young Robusta bushes [ibid., ix, p. 91], which in many respects resembles the disease under discussion. Altogether, this fungus was obtained in 315 out of 321 isolations, of which 238 were from top die-back and 77 from the 'instervende' type of the disease.

The fungus isolated from the affected trees is a species of *Rhizoctonia* characterized in culture by a thick, yellowish-white mycelium, hyphae measuring $5{\cdot}5 \pm 1{\cdot}9\,\mu$ in breadth, with septa about $107\,\mu$ apart, and pseudoconidial hyphae (with cells $26{\cdot}7 \pm 4{\cdot}8\,\mu$ long by $17{\cdot}3 \pm 2{\cdot}9\,\mu$ broad) which converge to form pseudosclerotia up to 0·5 mm. in diameter. In the wood vessels the

hyphae are narrower (2 to 6 μ) and neither pseudoconidia nor pseudosclerotia have been seen. This fungus appears to be identical with that isolated by Miss van der Meer from a top-diseased coffee tree in Java.

McNamara (H. C.) & Hooton (D. R.). **Studies of Cotton root rot at Greenville, Tex.**—*U.S. Dept. of Agric. Circ.* 85, 16 pp., 4 pl., 5 figs., 1929.

This bulletin gives a summarized report of observations from 1920 to 1927, inclusive, on the occurrence, distribution, and spread of the cotton root rot disease [*Phymatotrichum omnivorum*: *R.A.M.*, ix, p. 241] at the United States Cotton-breeding Field Station at Greenville, Texas. The fact that the disease may appear on freshly broken land indicates that it is native to many districts in Texas, and that the infection is probably of longer standing than generally supposed. There was evidence that the spread of the disease is due to growth and expansion in ever-widening circles of the original infection spots, rather than to the formation of new spots. The disease is apparently able to spread across the rows at about the same rate as along them. No indication was found, however, that the infection is carried through the field by mechanical agency. The fungus appears to be most active on the outer border of infection spots of the previous year. A preliminary experiment with barriers, consisting of narrow trenches, 12 and 24 inches deep, indicated that the advancing zone of the mycelium possibly extends to a depth of about 12 inches, but not to 24 inches in the soil at Greenville; active mycelium was occasionally found on cotton roots at a depth of 26 in., but usually it does not occur below 15 in.

Studies with clean fallows conducted since 1922 showed that a one-year fallow in some cases apparently retarded the appearance of the disease for three or four weeks; promising results were obtained with a two-year clean fallow, and it is believed that good results may be obtained by a combination of this system with a rotation of non-susceptible crops.

King (C. J.) & Loomis (H. F.). **Further studies of Cotton root rot in Arizona, with a description of a sclerotium stage of the fungus.**—*Journ. Agric. Res.*, xxxix, 9, pp. 641–676, 17 figs., 1929.

In this further report of the authors' study of the cotton root rot (*Phymatotrichum omnivorum*) in Arizona [*R.A.M.*, ix, p. 108] it is stated that in 1928 successful infection was obtained in cotton plants inoculated with cultures of the fungus grown for several months on dead tissues of cotton and other plants. These experiments are considered to prove conclusively that *P. omnivorum* can live as a saprophyte in the soil for long periods without losing its pathogenicity. The fact that active mycelium was found on decayed tree roots at a depth of six feet in the soil in some infected areas, and the extensive development of conidial mats at this depth, in trenches, prove that the organism is able to live throughout a considerable depth of soil. Barriers of fuel oil mixed with earth (about 1 part oil by weight to 10 parts earth), placed in

narrow trenches about 3 feet deep, in front of the advancing line of infection, or sheets of galvanized iron 26 to 36 inches wide, set on edge in similar trenches, were efficient in checking the spread of the fungus in lucerne fields. No reduction in the extent of infection was observed in two plots maintained for two years under clean fallow.

A description is given of large pseudosclerotial formations which developed in pure cultures on artificial media; these are more elaborate structures than the small wart-like masses of hyphae which are found on roots in the soil, and although under favourable conditions they may remain viable for long periods in the laboratory, none was found under natural conditions. In a large number of cultures on sterilized sand containing dead cotton plant tissues a type of true sclerotium also appeared as small, round or oval, tuber-like structures, 1 to 2 mm. in diameter, firm in texture, showing in section rather large, closely packed cells, with one or more surface layers of smaller and harder cells of very irregular shape. Their production was apparently favoured by cold, but once formed they were not injured by widely fluctuating temperatures or by submergence in water for long periods of time. They did not withstand desiccation in the air. The sclerotia are capable of prompt germination and produce hyphae consisting of large, *Rhizoctonia*-like cells which, in a short time, give rise to mycelial strands spreading over the substratum. Although the sclerotia have not as yet been observed in nature, it is thought probable that they occur under certain conditions and may play an important part in maintaining the fungus over winter.

Jaczewski (A. A.). О некоторых болезнях волокна Хлопчатника. [Some diseases of Cotton fibres.]—*Микробиол. Журн.* [*Microbiol. Journ.*], ix, 1, pp. 159–167, 1 pl., 1929.

The heavy losses which were caused in 1927 by a destructive outbreak in Central Asia of injuries affecting cotton fibres in the boll or as lint led the Russian authorities to undertake in 1928 a detailed survey in the chief cotton-growing areas of the Union of Soviet Republics for the purpose of determining the factors involved in the trouble. The results indicate that most of these injuries are associated with the presence of fungi, and isolations from infected bolls and lint have so far yielded over 70 species, 42 of which have been identified, including six species [five of which are described, with Latin diagnoses, in this paper] which are considered to be new to science. All these organisms (with the exception of some ten species of *Fusarium* which are facultative parasites) are pure saprophytes, the spread of which is ensured by various agencies, such as rain, wind, and very probably insects.

Nigrospora gossypii n. sp. ad inter. is apparently widely distributed in the south of Russia and in Central Asia, where it is commonly found on unopened bolls in the field, which are covered with a very fine black dust consisting of brownish-black, almost spherical or somewhat applanate, one-celled spores measuring 12 to 13·6 μ in diameter. The cotton fibres are surrounded and in places penetrated by a hyaline mycelium, from which arise short or more or less elongated, light olive-coloured, simple or irregularly

branched, septate conidiophores, each with one apical, at first hyaline but later darkening and finally entirely opaque conidium. The fungus is morphologically very similar to *N. oryzae* [*R.A.M.*, vi, p. 758], but as the latter has been so far recorded only on monocotyledons, and is not known to occur in Russia and Central Asia, the name *N. gossypii* is tentatively suggested for the form on cotton. *Macrosporium gossypii* n. sp. is characterized by a dark brown, creeping, nodose mycelium; the conidiophores are short, brown, septate, and dentate at the apex; the conidia are slightly clavate, frequently ovoid, light brown, with two or three transverse septa and sometimes one oblique or longitudinal septum, single or in short chains, and measure 22 to 27 by 9 to 11 μ. On agar a compact, black-purple mycelium develops and the substratum is blackened. This fungus is apparently a fairly active destroyer of cotton fibres. *Cladosporium gossypii* n. sp. has a hyaline to light olive, septate mycelium which penetrates the cotton fibres; the conidiophores are short, occasionally branched, somewhat nodose, and dentate above, bearing numerous, light olive, almost cylindrical to long-ellipsoidal, budding conidia, in long, often branched, chains; the conidia are at first continuous but later may become two- or more rarely three-celled, and measure 11 to 22 by 2·2 to 3 μ. This is apparently the most common species found on cotton fibres in the regions investigated and cotton bolls attacked by it are rendered entirely useless. *Brachysporium gossypii* n. sp. on cotton fibres forms a black efflorescence consisting of a brown, nodose, branched mycelium, with short, dentate, light brown conidiophores bearing single, clavate or pear-shaped, frequently curved conidia with three transverse septa, measuring 27 to 31 by 11 to 13·6 μ; the penultimate cell of the conidium is brown, but the terminal cells are lighter or hyaline. This species has so far been found only in the Golodnaya Steppe [South Russia]. *Helminthosporium nadsonii* n. sp. forms a black efflorescence on the cotton fibres, consisting of brown, nodose hyphae with simple or slightly branched conidiophores, dentate above and bearing single, long-ellipsoidal, light brown, smooth conidia with rounded ends, measuring 22 to 27 by 9 μ.

Vassilievsky (N. I.). Розовая мюскардина и ее возбудители.—**Spicaria aphodii Vuill. и S. fumoso-rosea (Wize).** [The pink muscardine and its causal organisms—*Spicaria aphodii* Vuill. and *S. fumoso-rosea* (Wize).]—*Morbi Plantarum*, Leningrad, xviii, 3, pp. 113–148, 9 figs., 1929. [German summary.]

This is a detailed account of the author's investigation of two species of fungi found in 1925 at the Experimental Entomological Station of Detskoye Selo [near Leningrad] occurring together on dead pupae of cabbage flies (*Hylemyia floralis* and *H. brassicae*). The organisms were identified as *Spicaria aphodii* Vuill. (as shown by a comparison with a pure culture obtained from the Centraalbureau voor Schimmelcultures, Baarn, Holland), and *Isaria fumoso-rosea* described by Wize on the beet beetle (*Cleonus* [*Bothynoderes*] *punctiventris*) from the Ukraine (*Bull. Intern. Acad. des Sciences de Cracovie*, pp. 713–737, 1904).

In pure culture the two fungi were found to be almost indis-

tinguishable morphologically except for some minor differences in the structure of the conidial apparatus. This similarity does not allow of maintaining the organisms in different genera, and *Isaria fumoso-rosea* is therefore referred to *Spicaria* and renamed *S. fumoso-rosea*. They differ, however, in their cultural characters on various media [a description of which is given] and in the tendency of *S. fumoso-rosea* to form coremia on infected insects. In pure culture the optimum temperature for growth of both species lies between 21° and 25° C.; at 3° to 6° the growth is very slow.

Details are given of a wide range of artificial infection experiments with both species on cabbage flies at various stages of their life. The most susceptible stage was found to be that of the grub at the moment when it burrows into the soil for hibernation; the grubs were successfully infected both by direct inoculation with the conidia of both species or by inoculating the soil. The pathogenicity of both species appeared to be similar and is not apparently impaired by the age of the cultures, since the strain of *S. aphodii* received from Holland, which had been maintained in pure culture for 16 years, was as virulent as the strain recently isolated from the insects. Pupae were infected only when directly inoculated, and did not contract the disease in infected soil. In the perfect stage cabbage flies fed on a sugar solution containing spores of the fungi, and also when placed in direct contact with the spores, became diseased and died, their bodies usually becoming mummified. It was shown that temperature plays a much more considerable part than humidity in the infection of the grubs in inoculated soil.

The paper terminates with a consideration of the possibility of controlling cabbage flies by these fungi, based on these investigations and on a small range of experiments under natural conditions which have given promising, although not quite conclusive, results.

PLANK (H. K.). **Fungi attacking Diatraea saccharalis Fabricius in Cuba.**—*Journ. Econ. Entom.*, xxii, 6, pp. 983–984, 1929.

During investigations conducted in Cuba since 1925 into the sugar-cane moth stalkborer (*Diatraea saccharalis*) on the larvae of which *Cordyceps barberi* Giard was reported in 1915 near Havana, a conidial form attributed to this fungus was occasionally found in several different localities; other, previously unreported, fungi found on this insect in Cuba [which are listed, together with the stage and months of attack] comprised *Aspergillus flavus*, *A. fumigatus*, *A. sydowi*, *A.* sp., a *Fusarium*, a *Penicillium*, and a fungus belonging to the *P. luteum* group. None of these organisms appeared to be of any practical importance in borer control. [This paper has been reprinted as *Scient. Contr. Tropical Plant Res. Foundation*, 17, 1929.]

BULL (L. B.). **Dermatomycosis of the sheep (lumpy or matted wool) due to Actinomyces dermatonomus (n. sp.)**—*Australian Journ. of Exper. Biol. & Med. Sci.*, vi, pp. 301–314, 2 pl., 1929.

A detailed description is given of a dermatomycosis of young

merino sheep which occurs in South Australia, and which is believed to be probably identical with the similar disease described by Seddon from New South Wales [*R.A.M.*, viii, p. 643]. In South Australia the disease is not very frequent and does not appear to be easily communicable by direct contact from one animal to another, but in some flocks over 20 per cent. of the lambs may be affected. Older sheep have not so far shown any apparent lesions.

The principal symptom is the presence of numerous small areas of densely matted wool scattered irregularly over the back and sides. In the early stages the lesion is essentially exudative in character. The skin under the matted wool looks raw. In most cases the infection is overcome in from one to three months, but occasionally the disease may become chronic and the lesions may remain active for 12 months or more ; in such cases the growth of the wool may be arrested, and the whole mass of matted wool may come away from the lesion beneath.

The causal organism, which was found in the matted wool and in the exudate from the skin of naturally infected sheep, appears as a branching mycelium or as short, bacillary forms and conidia. The branching of the mycelium is lateral, the side branches being short and usually somewhat thinner than the main hypha. In pure cultures the hyphae vary in diameter from under 0·5 to about 1 μ, but with the development of conidia the diameter commonly attains 1·75 μ. The conidia measure from below 0·5 to about 1·75 μ in diameter and the bacillary form varies in length from about 1·8 to 4·5 μ (most frequently 3·6 μ). This form is more often seen in cultures than the mycelial one. The development of conidia is more abundant in rapidly growing cultures, which have a streptococcal appearance. The morphological and cultural characters [which are described] indicate that the organism is a hitherto undescribed species of *Actinomyces* for which the name *A. dermatonomus* is suggested. Its pathogenicity to sheep, rabbits, guinea-pigs, white mice, the cow, and the horse was proved in artificial inoculation experiments.

Field and experimental observations indicate that the organism probably grows in the fleece when moisture conditions are favourable, and that the skin is subsequently invaded. The disease appears to be seasonal, occurring during the winter. As indicated by a series of experiments, infection of the young sheep may be prevented by dipping them in a 1 in 500 copper sulphate solution towards the end of autumn and again a month later.

Frost (K.), Sutherland-Campbell (H.), & Plunkett (O. A.). **Monilia of the tongue. Report of an instance with associated skin lesions (moniliatid ?).**—*Arch. of Dermatology*, xx, 6, pp. 811–819, 9 figs., 1929.

Full clinical, cultural, and morphological details are given of a case of *Monilia* of the tongue, associated with *M.* [*Candida*] *pinoyi* [*R.A.M.*, viii, p. 722 and next abstract], in a 36-year-old man at Los Angeles, California. There was a secondary extension of the lesions in the right axilla and on both groins. The condition was accompanied by intestinal disturbances similar to those occurring

in sprue [ibid., viii, p. 505]. The fungus was not isolated from the secondary lesions, which are believed to have been produced by absorption from the primary focus of infection, as in cases of trichophytosis and epidermophytosis [cf. ibid., ix, p. 36].

CASTELLANI (A.). **Urethromycoses of the male, and vulvovaginomycoses.**—*Journ. Trop. Med. & Hygiene*, xxxii, 24, pp. 357–358, 1929.

Clinical details are given concerning various forms of mycotic urethritis, associated with species of *Monilia* [*Candida*], *Cryptococcus*, *Oidium* [*Oospora*], *Saccharomyces*, *Nocardia* [*Actinomyces*], *Cladosporium*, *Aspergillus*, and *Penicillium*; and of mycotic vulvovaginitis connected with *Alternaria* and *Hemispora* in addition to the above-mentioned genera. *M.* [*Candida*] *pinoyi* [*R.A.M.*, ix, p. 181], *M.* [*C.*] *metalondinensis*, and *M.* [*C.*] *tropicalis* [ibid., vi, p. 96 and next abstract] have recently been isolated in England from several cases of purulent vaginitis.

KUROTCHKIN (T. J.) & CHU (C. K.). **Bronchomoniliasis: serological studies on a case.**—*Nat. Med. Journ. of China*, xv, 4, pp. 403–409, 4 figs., 1929.

Full clinical details are given of a fatal case of bronchomoniliasis in a male Chinese aged 58. The symptoms of the disease, which was of long standing, included marked emaciation, general weakness, irregular fever, coughing, and expectoration. The fungus isolated from the sputum was characterized by numerous budding yeast cells with, on some media, long, occasionally branched, double-contoured, markedly granular hyphae. Good growth was made on Sabouraud's agar at 37° C., the individual budding cells composing the round, creamy colonies being large, spherical, Gram-positive, and non-acid-fast. Development was retarded at room temperature and very sparse under anaerobic conditions. Profuse mycelial development occurred in peptone water. Acid and gas were formed in dextrose, maltose, saccharose, galactose, and levulose media; gelatine and coagulated serum were not liquefied. The fungus is tentatively identified with *Monilia* [*Candida*] *tropicalis*.

Laboratory animals given intravenous or intraperitoneal injections of a Sabouraud agar culture died of mycotic septicaemia within 24 to 48 hours. A post-mortem examination showed extensive destruction of the internal organs, especially the kidneys and heart. Small, disseminated, whitish nodules composed of growing fungal elements were found in the kidneys, liver, spleen, heart muscle, and lungs. Cultures from the blood and organs yielded a pure growth of the fungus. Milder symptoms were induced by subcutaneous inoculations and direct inoculation through the chest wall.

Specific immune reactions in the form of complement fixation and positive precipitation [details of which are given in a table] were obtained by the addition of the patient's serum to various extracts of the *Monilia* cells.

Stovall (W. D.) & Bubolz (Anna A.). **Forty strains of yeast-like fungi isolated from sputum.**—*Journ. Infect. Dis.*, xlv, 6, pp. 463–473, 8 figs., 1929.

From the sputum of 100 patients manifesting various types of pulmonary inflammation the authors isolated forty strains of yeast-like fungi, of which 37 fall into *Monilia* [*Candida*: *R.A.M.*, viii, p. 677] and one each into *Oidium* [(?) *Oospora*], *Endomyces*, and *Saccharomyces*. Three types of *Monilia* were identified among the 37 strains on the basis of sugar fermentation and colony formation on malt agar in 48 hours at 37° C., viz., *M. krusei* [ibid., viii, p. 105], *M. metalondinensis*, and *M. tropicalis* [see preceding abstracts]. The cultural reactions of the organisms remained constant over a period of two years. Animal inoculation experiments gave variable results.

Hoffstadt (Rachel E.) & Lingenfelter (J. S.). **A pulmonary infection caused by Monilia balcanica (Castellani).**—*Amer. Journ. Trop. Med.*, ix, 6, pp. 461–469, 4 figs., 1929.

The sputum of a 39-year-old male American suffering from pulmonary disturbances yielded, in isolations on Sabouraud's and other media, a species of *Monilia* [*Candida*] characterized by large, yeast-like cells, 4 to 7 μ in diameter. Hyphae composed of 14 to 18 cells were formed in glucose broth and bore lateral conidia and chlamydospores. On lactose litmus agar the conidia were apical. Abundant gas and acid were produced in 1 per cent. glucose broth; gelatine was not liquefied. The organism agrees with *M.* [*C.*] *balcanica* Cast., except in its inability to ferment levulose and maltose with acid formation. In a personal communication to the writers Castellani has confirmed the authors' determination of the fungus.

Abscesses and marked congestion of the lungs developed in laboratory animals inoculated intraperitoneally and intrapleurally with this fungus. Complement fixation reactions were obtained in the patient and in a rabbit inoculated intravenously. This is believed to be the first record of *C. balcanica* in association with pulmonary infection, Castellani having described it only in connexion with digestive ailments in the tropics.

Magalhães (O.). **Contribution to the knowledge of lesions caused by 'Oidium brasiliense' (O. Magalhães 1914).**—*Mem. Inst. Oswaldo Cruz*, xxii, pp. 37–134, 28 pl. (2 col.), 1929.

This is the continuation and conclusion of the author's previous notes on *Oidium* [? *Oospora*: *R.A.M.*, iii, p. 556] *brasiliense* [ibid., vi, p. 484], published in *Brasil Med.*, 22nd September, 1914, and *Mem. Inst. Oswaldo Cruz*, 1918. The present paper deals with the pathological histology of the lesions caused by the fungus in man and animals. All the internal organs may be attacked by *O. brasiliense*, which shows, however, a predilection for the pulmonary parenchyma. The lesions produced are often very similar to those of bacterial origin associated with nephritis, pneumonia, bronchitis, hepatitis, myocarditis, and the like. In the heart the fungus occurs chiefly in the form of yeasts, and in the lungs and other organs as

bacilliform and cocciform cells, sometimes accompanied by the so-called 'shuttle-shaped' forms.

The bibliography, which seems to cover a great part of the field of medical mycology, occupies 86 pages.

De Castro (A. M.). **Tinhas dos animaes domesticos en São Paulo. II.** [Ringworms of domestic animals in San Paulo. II.]—*Arch. Inst. Biol. Defesa Agric. e Animal*, ii, pp. 163–173, 13 pl., 1929. [English summary.]

Clinical, cultural, morphological, and experimental studies have been conducted on the forms of trichophytosis associated with *Trichophyton cerebriforme*, *T. rosaceum*, *T. lacticolor*, *T. granulosum*, and *T. asteroides* [*R.A.M.*, viii, p. 575], the two first-named being of bovine origin, the third of porcine, and the two last (stated to be rare in San Paulo) affecting cattle and horses. The lesions from which *T. cerebriforme* and *T. lacticolor* were isolated were typical kerions, while those caused by *T. rosaceum* were dry and extended, the nails also being attacked. *T. granulosum* and *T. asteroides* produced lesions of variable dermatological types. Trichophytosis is stated to be of rarer occurrence in San Paulo than microsporiosis.

Tschernogubow (N.) & Muskatblüt (E.). **Klinische Beobachtungen über die Immunität bei oberflächlichen Pilzerkrankungen der behaarten Kopfhaut.** [Clinical observations on immunity in superficial fungous diseases of the hirsute scalp.] —*Arch. für Dermatol.*, clix, 1, pp. 46–72, 1929.

The results [which are fully described and tabulated] of extensive observations on 1,823 children affected by fungous diseases of the scalp at the Moscow isolation hospital showed very few cases of reinfection, indicating the development of deep-seated immunity as a result of the first attack. This was particularly marked in the case of microsporiosis due to *Microsporon lanosum* [*R.A.M.*, ix, p. 110]. The immunity induced by *Trichophyton violaceum* proved more stable than that acquired as a result of infection by *T. crateriforme* [ibid., vii, p. 325].

Du Bois. **Trichophytie spontanée de la souris grise avec quelques considérations sur l'évolution naturelle de l'infection.** [Spontaneous trichophytosis of the grey mouse with some reflections on the natural development of the infection.]—*Ann. de Dermatol.*, Sér. VI, x, 12, pp. 1359–1363, 1 pl., 1929.

Three grey mice in a cage of nine contracted spontaneous trichophytosis, presumably through contact with some straw which had been renewed about a fortnight before the outbreak. The disease was subsequently transmitted to two other mice in the same cage, but in a greatly attenuated form. The causal organism was identified as *Trichophyton granulatum*, which was evidently present on the straw in a saprophytic form [cf. *R.A.M.*, viii, p. 105].

Catanei (A.). **Sur les altérations des cultures d'un Trichophyton gypseum au cours du vieillissement.** [On the modifications in cultures of a *Trichophyton gypseum* in the course of senescence.]—*Comptes rendus Soc. de Biol.*, xcii, 34, pp. 807–808, 1929.

A brief description is given of the cultural changes undergone during senescence by a strain of *Trichophyton gypseum* allied to *T. radiolatum* [*R.A.M.*, viii, p. 645], isolated from a cutaneous ringworm of man in Algeria. Three different types of cultures were obtained on agar media in addition to the classic white downy growth representing the final stage of pleomorphism, viz., a pale yellow, crateriform to cerebriform type, a similar one with crateriform, powdery colonies, and a bright to greyish-yellow, thick, powdery type. The intensity of conidial formation decreases from the first to the third type, the reverse being the case with the production of mycelium and chlamydospores. The first and second types retain their peculiarities after passage through the guinea-pig, while the third may revert either to the original *radiolatum* type or to the second one.

Tomkinson (J. G.). **Favus (Achorion quinckeanum) of the male genitalia.**—*Brit. Med. Journ.*, 1929, 3599, pp. 1194–1195, 3 figs., 1929.

Clinical details are given regarding a case of favus of the male genitalia recently examined at a Glasgow hospital. *Achorion quinckeanum* [*R.A.M.*, viii, pp. 309, 575] was isolated from the affected region. In view of its extreme rarity the condition (unique in the author's experience) is of considerable interest. The fungus may have been carried on some new clothing purchased shortly before the outbreak, or possibly mice (known to be present in the patient's house) were the source of infection.

Nanta (A.) & Oberling (C.). **Sidérose dans l'aspergillose splénique expérimentale.** [Siderosis in experimental splenic aspergillosis.]—*Comptes rendus Soc. de Biol.*, xcii, 35, pp. 914–916, 1929.

The inoculation into a dog's spleen of the spores of *Sterigmatocystis* [*Aspergillus*] *nantae* resulted in the development, within 36 days, of an inflamed, rust-coloured nodule the size of an almond, the centre of which was constituted by a fresh cicatricial tissue surrounded by an extensive zone of polymorphous cellular infiltration. The latter was found to consist, in part, of plasmocytes and macrophages containing the spores (living and dead) and rudimentary mycelium of the fungus. Ferruginous imbibition had taken place to such an extent that certain elements presented a markedly siderotic aspect. These facts conflict with Abrikossoff's recent assertion [*R.A.M.*, viii, p. 647] that siderosis of the spleen is not related to fungous infection.

Burgess (R.). **Further studies in the microbiology of wool. The enhancement of 'mildew' by soaps and vegetable oils.**—*Journ. Textile Inst.*, xx, 11, pp. T 333–T 372, 4 pl., 1929.

During the summer of 1928 an unusually severe epidemic of

mildew [cf. *R.A.M.*, ix, p. 36] affected stored woollen textiles in England, largely owing to the high temperatures prevailing in the mills. The mildew was caused almost entirely by fungi (chiefly *Penicillium* and *Aspergillus* spp.) and not by bacteria; frequently, although much fungal growth was present, the wool showed very little tendering. As it appeared to be probable that the wool at storing contained some readily available food substance (such as soap) sufficient to allow of a growth of mould fungi before the fibres themselves were attacked, extensive laboratory experiments [which are described and the results of which are tabulated and discussed] were conducted to test this assumption.

It was ascertained that soaps, wool creams, and most of the conditioning fluids tested favoured the development of mildew, owing chiefly to the alkali present in these substances, which by combining chemically with the wool renders the nitrogen of the latter available as food for the fungi. With hygroscopic soap, such as potash olive oil soft soap, another contributing factor is the increase in range of relative atmospheric humidity over which mould growth may occur, this increase appearing to be related to the amount of soap present. The German commercial conditioning fluid 'hygrolit' and two similar [unnamed] products slightly retarded mould growth. Vegetable oils favoured such growth, but less so than did soap. The lower fatty acids, such as caprylic, caproic, and lauric acids, retarded the growth of moulds, but the more complex ones, such as oleic acid, favoured it. Mineral oils exercised a protective influence against moulds as they were not used as a food by the fungi. Confirmation of these results was obtained from an examination of materials which had undergone different processes of manufacture and contained different amounts of soap and oil.

The greenish-yellow stains which occur on mildewed wool were found to result from mould action on the soap present; when olive oil was used in the processing it appeared to increase the discoloration.

The washing of scoured or unscoured wool in several changes of warm or hot water considerably reduced the liability to mildew. Evidently the removal of water-soluble substances, as well as of the fat, reduces the tendency to mildew.

The range of reaction over which mould growth can take place on wool is considerable, the latter being favoured by both alkaline and acid conditions.

Orthmann (A. C.) & Higby (W. M.). **Mold growth on leather and its prevention.**—*Journ. Amer. Leather Chem. Assoc.*, xxiv, 12, pp. 657–663, 1929.

In 1925 the writers investigated a defect appearing on the grain side of coloured calf skins in the form of light spots, 0·1 to 10 mm. in diameter. The spots could only be covered by the application of numerous layers of pigment which considerably detracted from the appearance and value of the leather.

It was found that the spots were caused by moulds developing in profusion on the leather in the so-called 'blue' state, i. e., after tanning and before colouring the skins, the period elapsing between

these two processes being from three to five days. A number of organisms, including *Aspergillus niger*, *A. fumigatus*, *A. versicolor*, and species of *Penicillium* were isolated from material, solutions, and stock. In one case the dust-collecting system was close to a roof where turbine condensation water was being sprayed for cooling. This water, which was also used in various other tannery operations, was found to contain an average of seven mould spores per c.c. and therefore acted as an important source of mould contamination. Two other important sources of infection were chrome tanning liquors and cornflour.

The results [which are discussed and tabulated] of disinfection experiments with a number of antiseptics indicated that the best preventive of mould growth is beta-naphthol [*R.A.M.*, vii, p. 255], applied at the rate of 5 oz. per 100 galls. of liquid during the last half hour of tanning. Further precautions included the suspension of the use of turbine condensation water for all operations previous to colouring and fat-liquoring; the sterilization of stock chrome tannin solutions by the addition of 1 gall. liquid (35 per cent.) sodium bisulphite per 400 galls.; the heating of the cornflour to 220° F. for four hours; and the disinfection of burlap used for covering skins by immersion in a 1 in 500 solution of phenol.

In 1926 *P. divaricatum* (recognizable by its characteristic odour of heliotrope on 'blue' skins) was very prevalent but caused no damage. It was destroyed in laboratory tests by a mixture of equal parts of beta-naphthol and phenol in the tan drum. The treated skins could be stored at 45° to 50° for 4 to 6 weeks.

STANER (P.). **Belgian Congo: a new disease of Sisal.**—*Internat. Bull. of Plant Protect.*, iii, 12, p. 179, 1929.

Sisal (*Agave rigida* var. *sisalana*) in the Belgian Congo is stated to be affected by a form of mosaic hitherto unknown except possibly from the Philippine Islands [*R.A.M.*, vi, p. 341]. Pale green, transparent spots, later turning yellow with brownish-red margins, develop on the young leaves of plants from six months to three years old. The disease, which is due to a filterable virus, renders both the leaves and fibres useless. A predisposing cause of sisal mosaic is the infertile nature of the soil in the affected region. All diseased leaves should be removed and immune suckers or bulbils collected in order to establish a resistant variety.

LE CLERG (E. L.). **Some common diseases of ornamental plants.**—*Colorado Agric. Exper. Stat. Bull.* 351, 31 pp., 14 figs., 1929.

Popular notes are given on the causes, symptoms, and control of some well-known diseases of ornamental plants in Colorado. Directions are appended for the preparation of some standard fungicides, with a list of approximate prices of the requisite materials.

NANNIZZI (A.). **Una bacteriosi della 'Zinnia elegans' Jacq. (Nota preliminare).** [A bacteriosis of *Zinnia elegans* Jacq. (Preliminary note).]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, iv, 5–6–7, pp. 416–417, 1929.

Zinnia elegans plants in a garden at Sienna were recently

found to be suffering from a bacterial disease, manifested by a yellowish-brown to reddish spotting of the basal leaves and resulting in atrophy of the inflorescences and rapid death. Cultures from the diseased tissues on *Zinnia* leaf decoction and agar yielded a rod-shaped, spore-forming bacterium measuring 3 to 4 by 0·2 to 0·3 μ, which is thought probably to infect the plants from the soil. The organism was constantly accompanied by *Trichoderma lignorum* [*R.A.M.*, vii, p. 741].

Nicolas (G.) & Aggéry (Mlle). **Un nouvel exemple d'infection bactérienne généralisée chez les végétaux.** [A new example of generalized bacterial infection in plants.]—*Comptes rendus Acad. des Sciences*, clxxxix, 22, pp. 946–947, 1929.

A brief description is given of a diseased condition of a plant of *Stranvaesia davidiana* (a species of Rosaceae native in Tibet) in the Botanic Garden of Toulouse, believed to be caused by systemic invasion of the plant by a soil-inhabiting bacterium, and greatly resembling in its general aspect that of *Cerasus caroliniana* reported by the authors in a previous paper [*R.A.M.*, viii, p. 730]. The bacterium is a small organism occurring in cultures either singly, or in chains of two to four, or groups of four cells disposed side by side. It has been isolated from all the affected organs of the plant, particularly from the root system, and occurs in all the tissues, including the vessels. The more superficial roots are abundantly branched, short, thick, and somewhat coralloid; the thicker roots exhibit nodosities and cankers; the small rootlets, which also bear small nodosities, are excessively branched and the tips of the extreme ramifications are frequently swollen. In the leaves the main symptom is the development, at an early stage, of a brown discoloration, usually from the tip but occasionally also from one side of the leaf, separated from the healthy parts by a zoned margin, yellow inside and red outside. Not infrequently the leaves also exhibit a characteristic mottling. The flowers usually fail to open and fall off, and the tips of the twigs and inflorescences wilt and die.

Although the authors were not able to test the pathogenicity of the bacterium by inoculation, the fact of its presence throughout the plant strongly suggests that it is responsible for the diseased condition. This suggestion is also supported by the examination at their request of *S. davidiana* plants in the Botanic Garden of Edinburgh, which were found to be free from the pathological symptoms described above, and also from the bacterium.

Barrett (J. T.). **A severe case of aerial 'crown gall' on hot-house Roses.**—Abs. in *Phytopath.*, xix, 12, p. 1145, 1929.

Some 3,000 Golden Ophelia roses in a greenhouse near Oakland [California], examined in December, 1928, bore aerial galls of *Bacterium tumefaciens* [*R.A.M.*, viii, p. 705] on the stems and leaf petioles. Many infections occurred at the cut ends of the stems after the removal of the flowers. The roots of the infected roses, which were removed and burnt in May, 1929, were almost uniformly clean and healthy. On the other hand, the Russell variety in another house showed considerable crown infection but no aerial

galls. Aerial galls are further developing extensively on the Mensing variety, which is stated to be closely allied to Golden Ophelia. The causal organism is probably spread by overhead sprinkling.

Howarth (W. O.) & Chippindale (H. G.). **An example of high mortality in Rhododendrons.**—*Gard. Chron.*, lxxxvi, 2242, p. 471, 1929.

The examination at Manchester University, of Pink Pearl hybrid rhododendrons which died off, three to five years after grafting, during the autumn and winter of 1928, revealed the presence of *Diplodina eurhododendri* and *Pestalozzia macrotricha* [*R.A.M.*, v, p. 392] on the cortical lesions of the stems and branches, and also in the blackened areas of the leaves. *P. macrotricha* and a fungus producing only sclerotia were frequently isolated from the inner tissues of diseased plants, but inoculation experiments proved them to be only weakly parasitic, while *D. eurhododendri* was entirely innocuous. The primary cause of the disease is believed to be an unsuitable method of grafting ('saddle' grafting) involving the use of stocks and scions of unequal thickness, which failed to unite completely and caused an undue strain on the plant. The graft unions were further placed just below soil level, a position favouring fungal activity and preventing the hardening of the callus.

Landgraf (T.). **Eine Lichtnelkenseuche.** [A *Lychnis* disease.] —*Blumen- und Pflanzenbau*, xliv, 12, pp. 221–222, 2 figs., 1929.

Lychnis chalcedonica in the Hamburg district was severely attacked during 1929 by a species of *Fusarium* with falcate, septate spores measuring 10 to 14 by 2 to 3 μ (possibly *F. dianthi*) [*R.A.M.*, vii, p. 9]. Diseased plants show malformations of the stalks and shoot tips, a yellow discoloration of the stem bases, and a brown or whitish spotting of the foliage. The plants very easily break off at the base and ultimately die. The fungus occurs in the soil and may be controlled by the application of formalin at the strength of 0·1 per cent., 30 to 40 l. of the solution being required per sq. m. The treated area should be covered with soil for 24 hours to prevent the escape of the gas, and 14 days should elapse before planting the seedlings.

Smith (C. O.). **Leaf and scape spot of the Amaryllidaceae in California.**—Abs. in *Phytopath.*, xix, 12, pp. 1138–1139, 1929.

Phyllosticta narcissi produces red spots on *Hippeastrum* and dead, yellowed areas on narcissus. In connexion with a series of successful inoculation and cross-inoculation experiments with the fungus, a form resembling *Stagonospora curtisii* was found. A comparative study of this form and of *P. narcissi* indicates that the two are probably identical. The pycnidia of *P. narcissi* contain spores of variable shape, size, and septation: unicellular, 4·5 to 10·3 by 3 to 4·5 μ; bicellular, 8 to 13 by 5 to 6 μ; and tricellular, 12 to 18 by 4·5 to 6 μ. The *Stagonospora* form developed on tissues inoculated with *P. narcissi* and cultures made from spores of the former again gave the latter.

Horsfall (J. G.). **Species of Cercospora on Trifolium, Medicago, and Melilotus.**—*Mycologia*, xxi, 6, pp. 304–312, 3 figs., 1929.

The critical study briefly described in this paper was undertaken in view of the difficulty encountered by the author in assigning specific names to the representatives of the genus *Cercospora* that occur on forage legumes in the United States. From the literature it appears that six species of *Cercospora* have been described on species of *Trifolium*, *Medicago*, and *Melilotus*, and the original descriptions of these were obtained, as well as type material of all the species, with the exception of *C. meliloti* (Lasch) Oud. and *C. helvola* Sacc.; the last named was studied from Saccardo's drawings of the type. A comparison of this material with that collected by him in the field led to the conclusion that all the species, with the possible exception of *C. meliloti*, are in reality identical and, for reasons of priority, should be known as *C. zebrina* Pass., the other names (including *C. davisii*, *C. medicaginis*, and *C. stolziana*) being synonyms. This conclusion is based on the results of a critical study of spore measurements (the variations in the means of which are so small as to have no specific value), and of the conidiophores; the latter may vary in length, in dependence on environmental conditions, and may be either continuous, or septate and geniculate, according to their age and the number of conidia produced. Further, the cultural characters of, and symptoms produced by, all the fungi studied were sufficiently similar to support the conclusion arrived at.

A brief English diagnosis and the host range of *C. zebrina* are appended.

Weston (W. H.) & Craigie (J. H.). **Observations on tassels of Teosinte malformed by Sclerospora.**—*Journ. Agric. Res.*, xxxix, 11, pp. 817–836, 4 figs., 1929.

A detailed morphological and histological description is given of the malformations in specimens brought from the College of Agriculture of the Philippines of the tassels of teosinte plants (*Euchlaena luxurians*) infected with *Sclerospora philippinensis* [*R.A.M.*, ii, p. 359]. Besides the malformations of the tassels, which, in general consisted of a considerable reduction of the length of the rachis internodes, a reduction in size and number of all the floral elements, and an excessive hypertrophy of the glumes and lemmas, the female inflorescences were suppressed, resulting in complete sterility of the infected plants, accompanied by unusually prolific vegetative growth. In tassels left lying on the ground during heavy rains, deformed spikelets, comprising leafy shoots resembling seedling plantlets, remained green and vigorous, grew into an upright position, produced roots at their base, and when transplanted continued to develop independently for over a week. The mycelium of *S. philippinensis* was found to be in an active condition inside the tissues of these plantlets, and was apparently capable of further growth.

The formation of such plantlets, capable of independent existence, is stated to be unusual in the tribe Maydeae and exceedingly rare in teosinte; it is considered to be a case of apogamy, in the general sense of this term. In comparing these malformations in teosinte

with those that occur in other grasses following infection with different species of *Sclerospora*, the authors discuss at some length their bearing on the general question of floral malformations and their possible significance in the relationships of the cultivated maize plant.

WESTON (W. H.). **A new Sclerospora from Australia.**—*Phytopath.*, xix, 12, pp. 1107–1115, 1 fig., 1929.

A species of *Sclerospora*, differing in morphological characters from the related *S. graminicola* [*R.A.M.*, ix, p. 105], was found by R. J. Noble in February, 1928, in New South Wales on clumps of a native grass (*Sorghum plumosum*) [*Andropogon australis*] known as wild sorghum. The diseased plants presented a shrivelled appearance and the leaves, through disintegration of the tissues between the fibrovascular bundles, had shredded into tangled skeins of withered, thread-like fibres. The oospores of the new *Sclerospora*, to which the name *S. noblei* is given, measure on an average 23 to 28·9 μ in diameter, compared with 33 to 34·9 μ in *S. graminicola*, while the wall of the oospore of the former is only 1 to 1·5 μ thick as against 2 to 4 μ in the latter. The colour and structure of the oogonial wall are also distinct in the two species. No conidial stage was seen.

MARTIN (W. H.) & CLARK (E. S.). **Apple scab studies in 1927.**—*Forty-ninth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1928*, pp. 262–267, 1 graph, 1928. [Received February, 1930.]

Further studies were conducted to determine the time of discharge of apple scab (*Venturia inaequalis*) ascospores in various districts of New Jersey [*R.A.M.*, viii, p. 45]. The first mature spores were observed in Atlantic County on 23rd March, the corresponding dates for Cape May, Gloucester, Mercer, and Cumberland Counties being 7th, 1st, 14th, and 6th April, respectively. Tables are given showing the relation of ascospore discharge to rainfall. At New Brunswick there was an almost continuous discharge from 18th April to 27th May, during which period there were 22 days of rainfall. The last discharge occurred on 27th June, a total discharge period of 71 days. The heaviest spore discharge period at Bridgeton was from 11th April to 30th May, during which time there was only a light rainfall on any one day. The last spores were discharged on 24th June, a total discharge period of 74 days.

The total omission of spraying resulted in a heavy increase of infection, only 4·5 per cent. of the fruit in a block being clean, compared with 92·8 per cent. where all the applications of the usual spraying programme were given. The omission of certain sprays caused more or less increase in the severity and extent of infection.

THOMAS (H. E.) & BURRELL (A. B.). **A twig canker of Apple caused by Nectria cinnabarina.**—*Phytopath.*, xix, 12, pp. 1125–1128, 1 fig., 1929.

In the early summer of 1927 some Rome and Northern Spy

apple trees in an orchard in New York State were found to be attacked by *Nectria cinnabarina*, which produced small cankers on the fruit spurs of the preceding season [*R.A.M.*, iii, p. 256; vi, p. 167]. The fungus was also observed in profusion on currants a short distance from the Rome trees [ibid., vi, p. 564]. Superficially the symptoms of the *Nectria* disease resemble those of fireblight [*Bacillus amylovorus*], except that the foliage and bark assume a light instead of a dark brown coloration. The bark and wood are killed from the tip of the spur downward to a distance of 1 to 4 inches, and branches arising therefrom are girdled and killed. As the season advances the bright pink sporodochia appear in large numbers on the dead bark.

The cultures of *N. cinnabarina* from apple were found to differ in certain respects from those obtained from currants at Ithaca. The optimum temperature for the development of a strain of *N. cinnabarina* from apple was 21° C.; slight growth occurred at 3°, moderate at 27° to 29°, and none at 33°.

Inoculation experiments on wounded twigs of the McIntosh and Wealthy varieties, and on fruit spurs of Rome, Northern Spy, and Winter Banana, gave positive results, infection being most severe on McIntosh and Rome. Under natural conditions infection apparently takes place in the late autumn or early spring at or near the point of detachment of the fruit from the cluster base. In 1929 a considerable number of ascospores were mature by 1st March, and by 7th April many twigs were found killed by cankers. Little or no infection appears to develop during the summer, though conidia are produced in abundance from midsummer onwards. The cankers of one season do not usually persist into the next. Moderately vigorous trees seem to be more susceptible than very healthy or quite feeble ones.

Green (D. E.). **Brown rot of Apples.**—*Gard. Chron.*, lxxxvi, 2244, p. 507, 1 fig., 1929.

Notwithstanding the dry weather prevailing in England during the summer of 1929, the causal organism of brown rot (*Sclerotinia fructigena*) [*R.A.M.*, viii, p. 253] spread to a considerable extent on apples at Wisley, Surrey. The careful examination of any spur bearing diseased fruits revealed the presence of a mummied apple either on the spur itself or on a neighbouring branch, often almost concealed by foliage. A case in which infection spread from a mummy to adjacent fruits was observed on a tree of the Scarlet Pearmain variety at a time when no rain had fallen for weeks. In this connexion attention is drawn to the importance of removing and burning the mummied apples of the previous year's crop, as well as all infected spurs and dead wood in which the fungus may also hibernate.

Carne (W. M.), Pittman (H. A.), & Elliot (H. G.). **Studies concerning the so-called bitter pit of Apples in Australia; with special reference to the variety Cleopatra.**—*Australia Council Sci. & Indus. Res. Bull.*, 41, 88 pp., 14 pl. [2 col.], 2 figs., 2 graphs, 1929.

This is a preliminary report, preceded by a comprehensive

review of the literature, of the study which is being conducted by the Western Australia Department of Agriculture of bitter pit of pome fruits, with special reference to the highly susceptible apple variety Cleopatra [cf. *R.A.M.*, vii, pp. 101, 102; viii, pp. 251, 511].

The authors' investigations have shown that several distinct troubles have been confused in Australia. These are classified into Jonathan spot, cork, and true bitter pit, and a clear definition of each is given. Cork includes four different forms, namely (*a*) internal cork, which corresponds to Mix's original description of cork [*New York (Geneva) Agric. Exper. Stat. Bull.* 426, 1916]; (*b*) crinkle cork—McAlpine's crinkle ['Bitter pit investigations', 1911–16]; (*c*) blotchy cork; and (*d*) drought-spot cork—Mix's superficial drought spot. Blotchy cork does not appear to have been described elsewhere and is stated to be the common form of cork in Australia, and the only one likely to be confused in non-typical cases with true bitter pit. It originates in apples while still on the trees (never in store), and is associated with large necrotic areas scattered through the flesh from near the surface to close to the core line. The surface is disfigured by irregular, deep green or brown, or mottled green and brown depressions of variable size, up to 2 by 3 cm., which give the fruit a rugose appearance. The losses caused by this form in susceptible varieties, e. g., Cleopatra, not infrequently amount to 20 to 30 per cent. of the crop in Western Australia.

True bitter pit or stippen is a disease which originates almost entirely in stored fruit, and only rarely in fruit on the trees. It is characterized by few to numerous circular or subcircular pits on the surface of the apples, mainly at the calyx end. The pits may be hardly visible externally, but more commonly average about 3 mm. in diameter, with a maximum rarely exceeding 6 mm. They are associated with small necrotic areas in the flesh, which, however, may also be present without any surface pitting. In colour the pits may be grey-green, olive-green, light brown, dark chocolate-brown, or almost black. In storage two forms of the trouble have been noted, namely, (*a*) mild pit, with small, rather inconspicuous surface lesions, which occurs both in cold and in ordinary storage, and (*b*) severe pit, characterized by relatively large depressions, dark in colour, and occurring only in cold storage.

Observations and experiments conducted in 1928 have shown that storage bitter pit in fruit of susceptible varieties occurs when these are picked at an insufficiently mature stage. Picking maturity is defined as the stage in the development of an apple after which, if picked, it will continue its normal ripening processes, i. e., pass to full maturity, while the latter (also termed ripeness) is that stage in the life of an apple when the ripening processes are completed, i. e., when the apple has developed its characteristic flavour and texture, and contains very little or no starch, the disappearance of which was shown to be intimately associated with the process of maturation. The iodine method of determining maturity is described [ibid., ix, p. 113].

The evidence so far collected would indicate that, as suggested by Mix, the probable cause of cork is the withdrawal of water from the fruits by the leaves during periods of high transpiration

and insufficient water supply to the roots, while bitter pit appears to be confined to varieties of apple which lose their starch during maturation in a very irregular manner.

Control measures on the lines already recommended are indicated, and a bibliography of 67 titles is appended.

Pitman (G. A.) & Cruess (W. V.). **Hydrolysis of pectin by various microorganisms. A comparative study.**—*Indus. & Engin. Chem.*, xxi, 12, pp. 1292–1295, 1 graph, 1929.

The results are tabulated and discussed of determinations of the pectinase activity of various micro-organisms occurring on fruit, grown aerobically at room temperature in or on apple juice containing added apple pectin. The strongest hydrolytic action was found to be exerted by *Pythium* sp. and *Penicillium glaucum*, the former destroying practically all the pectin (95·7 per cent.) in 12 weeks and the latter 76·3 per cent. Two other species of *Penicillium* and one of *Mucor* destroyed 15·8, 22·9, and 15·8 per cent. of the total pectin during the same period, *V*[*erticillium*] *alboatrum* 18·6 per cent., *R*[*hizopus*] *nigricans* 19·8 per cent., *Botrytis* sp. 27 per cent., *Cytospora* sp. 44·1 per cent., *Colletotrichum* sp. 16·8 per cent., and *Bacillus amylovorus* 8·2 per cent. Pectin hydrolysis by *P. glaucum* was more rapid at P 6 and 5 than at P_H 3.

Smith (R. E.). **Diamond canker of the Prune.**—Abs. in *Phytopath.*, xix, 12, p. 1139, 1929.

French prunes of the Standard variety are liable [in California] to the disease known as diamond canker [*R.A.M.*, vii, p. 621], which causes a pronounced roughening and swelling of the bark on the trunk and main limbs. In the early stages of the disease, which develops very slowly, the production of fruit is stimulated, but later stunting and death occur. The canker originates in the phellogen and consists chiefly of a thick, leathery mass of heavily suberized cork cells resembling the normal outer bark of many trees. Diamond canker, which is apparently confined to this one variety of prune and does not affect other fruit trees, is believed to be caused by a slow-acting fungous or bacterial infection initiated in wounds, cracks, or pruning cuts in which callus formation is taking place. A fungus resembling *Dematium pullulans* [ibid., viii, p. 67] was regularly isolated from the cankers, together with a species of *Actinomyces* and a small bacillus.

Smith (R. E.). **Life-history of Sclerotinia sclerotiorum (Lib.) Mass., in connection with the green rot of Apricots.**—Abs. in *Phytopath.*, xix, 12, pp. 1136–1137, 1929.

Young apricot fruits in California are liable to infection, through the old calyces adhering to the surface, by *Sclerotinia sclerotiorum* [*R.A.M.*, vii, p. 673]. The fungus is disseminated by means of ascospores produced in apothecia from sclerotia in the soil during wet weather. The dry, cold winter and early spring of 1929 were very unfavourable to the development of green rot, neither apothecia nor mycelium being observed after 1st March. Blossoms and young apricots and other fruits, wild flowers, etc., were collected

at weekly intervals and placed in moist chambers. It was ascertained by this method that *S. sclerotiorum* was present on all sorts of vegetation in central California between 1st March and 1st May. Germinable conidia were occasionally produced but no other imperfect stage of the fungus, from which it would appear that ascospores or some other reproductive form of the organism were produced and widely distributed some time before the first observations.

Leach (L. D.). **Observations on powdery mildew of Raspberry in California.**—Abs. in *Phytopath.*, xix, 12, pp. 1144–1145, 1929.

Preliminary morphological studies of the perithecial stage of a fungus found in abundance in the Santa Clara Valley, California, in the autumn of 1928, on diseased raspberry canes (near the apex), leaves, petioles, and flower-buds, reveal a close agreement with *Sphaerotheca humuli* [*R.A.M.*, viii, p. 113]. To determine whether the mildew overwinters by perennation of the mycelium within the buds, as reported from Minnesota, four plants and 192 cane tips which had previously shown severe infection were transferred to the greenhouse during the dormant stage. Only one of the 969 shoots developing from this material was mildewed. Field observations in the spring of 1929 showed that almost all early infection was confined to the new growth arising from the roots during the current season, suggesting that the perithecia on the débris around the base of the plants may be the common source of overwintered spores in California.

Dobroscky (Irene D.). **Cranberry false blossom disease spread by a leafhopper.**—*Science*, N.S., lxx, 1826, p. 635, 1929.

Recent investigations have confirmed the author's observations and field experiments during 1924 to 1926, that the false blossom disease of cranberries [*R.A.M.*, vi, p. 363] is spread by the leafhopper *Euscelis striatulus* (*Proc. 58th Ann. Meet. Amer. Cranberry Growers' Assoc.*, p. 6, 1928). Cranberry seedlings grown in a greenhouse kept free from insects by fumigation contracted the symptoms of false blossom (small leaves, erect type of growth, and abnormally heavy production of secondary shoots) only when exposed to contact with *E. striatulus* from the cranberry bogs of Massachusetts, Long Island, and New Jersey. Numerous seedlings on which the insects were placed for a fortnight after they had fed for varying periods on diseased cranberry plants, developed the condition in about a month. One plant to which false blossom was experimentally transmitted produced two typical false blossom flowers.

Sideris (C. P.) & Paxton (G. E.). **Pythiaceous root parasites of Pineapples.**—Abs. in *Phytopath.*, xix, 12, pp. 1145–1146, 1929.

Eight species of *Nematosporangium*, five of *Pythium*, and two of *Phytophthora* were isolated from the roots of diseased pineapples [in Hawaii: see below, p. 343], two species of *Nematosporangium* and *Pythium splendens* [*R.A.M.*, vi, pp. 380, 749; vii,

p. 2; viii, p. 187] predominating. The roots of plants placed for observation in a box filled with a composite soil sample (about ½ cu. ft.) were examined daily, the dead ones being removed and put on *Carica papaya* agar media. All the organisms thus isolated reproduced the disease on reinoculation.

SIDERIS (C. P.). **Stem rot of Pineapple plants.**—Abs. in *Phytopath.*, xix, 12, p. 1146, 1929.

Stem rot of pineapple (in Hawaii) is caused by three Pythiaceous fungi [see preceding abstract], viz., *Phytophthora meadii*, *P. melongenae*, and another of a possibly new but closely allied genus. *P. meadii* [*R.A.M.*, viii, p. 333] has been isolated from diseased plants on the island of Oahu and *P. melongenae* [ibid., vii, p. 602] on Lanai. The former organism has also been found to cause fruit rot and the latter stem rot of *Antirrhinum*. The undetermined organism is morphologically like *Pythium splendens* and *Phytophthora parasitica* [loc. cit.]. Neither zoospores nor oospores have been observed. This fungus is very destructive to young pineapple plants during periods of high humidity and relatively low temperature (60° to 70° F.); it may cause either stem or root rot. The organisms invade the stems through the basal tissues of tender leaves, causing a soft rot.

SIDERIS (C. P.). **Pineapple root rots caused by species of Fusarium.**—Abs. in *Phytopath.*, xix, 12, p. 1146, 1929.

About 30 species of *Fusarium* have been isolated from wilted pineapple roots [in Hawaii: cf. *R.A.M.*, iii, p. 122]. One of these organisms, an extremely weak parasite, was observed to invade the water-conducting vessels and kill the tips of a few inoculated roots to a distance of two inches. The infected roots were in very wet soil, those grown under drier conditions remaining healthy. Another species attacks the main root through minute rootlets or lateral roots. Once established on dead superficial tissues the fungus kills the root by means of toxins, the tissues permeated by which turn brown from the effect of the dead protoplasm of the pineapple cells. The organism has never been found among the discoloured tissue, but spreads throughout after further chemical decomposition of the brown material.

CATHCART (C. S.) & WILLIS (R. L.). **Analyses of materials sold as insecticides and fungicides during 1929.**—*New Jersey Agric. Exper. Stat. Bull.* 485, 16 pp., 1929.

This bulletin presents the results of the examination of 148 samples of insecticides and fungicides collected for inspection during 1929 [*R.A.M.*, viii, p. 53].

Nine proprietary brands of Bordeaux mixture were examined for their copper content, namely, (1) Acme Bordeaux mixture (Acme White Lead and Color Works, Boston, Mass.), containing 13·36 per cent. metallic copper. (2) Bordeaux mixture powder (Ansbacher Insecticide Co., Inc., New York), 14·10 per cent. (3) Bordeaux mixture powder (Grasselli Chemical Co., New York), 14·14 per cent. (4) and (5) Key Brand Bordeaux mixture powder (Interstate Chemical Co., Jersey City, N.J.), 16·44 and 15·97 per

cent., respectively. (6) Green Cross Dry Bordo, (7), (8), and (9) Green Cross Cloros (Dry Bordo 9 per cent., Dry Bordo 22 per cent., and Dry Bordo 12 per cent., respectively), manufactured by the Lucas Kil-Tone Co., Vineland, N.J., and containing 20·77, 11·08, 23·73, and 13·25 per cent. metallic copper, respectively.

The Niagara Sprayer and Chemical Co., Inc., Middleport, N.Y. supplies a guaranteed 99·5 per cent. pure sulphur, known as the Niagara Supreme Dusting 99½ per cent. pure sulphur, which actually contained 99·87 per cent.

The sulphur content of the following mixtures was determined. (1) Adheso 300 mesh 80–20 sulphur-lime dust (Ansbacher Insecticide Co.), containing 76·95 per cent. sulphur (80 per cent. guaranteed). (2) Flowered sulphur (Farmer's Co-operative Association, Trenton, N.J.), 93·68 per cent. (3) and (4) 80–20 sulphur-lime dust and New Jersey dry-mix sulphur-lime (J. R. Gillam and Bro., Burlington, N.J.), 77·32 and 59·58 per cent., respectively (78 and 62 per cent. guaranteed). (5) Koppers Thylox Sulphur Cake (Koppers Products Co., Pittsburgh, Pa.), 59·26 per cent. (6), (7), and (8) Trick sulphur, sulpho-tone, and 80–20 sulphur-lime dust (Lucas Kil-Tone Co.), 91·63, 63·65, and 79·59 per cent., respectively. (9) and (10) Mechling's Superfine 80–20 dusting mixture, (11) Mechling's dry-mix (Mechling Bros. Chemical Co., Camden, N.J.), 79·37, 78, and 60 per cent., respectively. (12) and (13) Niagara koloform, (14) and (15) Niagara 80–20 mixture, (16) Niagara kolodust, and (17) Niagara dry-mix (Niagara Sprayer and Chemical Co., Inc., Middleport, N.Y.), 63·34, 61·96, 79·54, 76·64, 97·43, and 66·07 per cent., respectively.

The following dry lime-sulphur and soluble sulphur compounds were analysed. (1) Bowker's dry lime-sulphur (Bowker's Chemical Co., New York), containing 64·06 per cent. total sulphur. (2) Dry lime-sulphur (Grasselli Chemical Co., Cleveland, Ohio), 63·38 per cent. (3) Key Brand dry lime-sulphur (Interstate Chemical Co.), 63·10 per cent. (4) Niagara soluble sulphur compound (Niagara Sprayer and Chemical Co., Inc.), 56·14 per cent. (5) and (6) Dry lime-sulphur (Sherwin Williams Co., Cleveland, Ohio), 62·96 and 62·95 per cent., respectively.

Three brands of lime-sulphur solution were examined, viz., (1) Grasselli lime-sulphur solution (Grasselli Chemical Co., Cleveland), containing 25·33 per cent. total sulphur. (2) Mechling's concentrated lime-sulphur solution (Mechling Bros. Chemical Co.), 24·92 per cent. (3) Lime-sulphur solution (Standard Chemical Works, Reading, Pa.), 24·28 per cent.

Analyses of a number of miscellaneous fungicides and insecticides are also given.

Truffaut (G.) & Pastac (I.). **Sur l'emploi des colorants organiques dans le traitement des affections cryptogamiques des végétaux.** [On the use of organic dyes in the treatment of cryptogamic diseases of plants.]—*Comptes rendus Acad. d'Agric. de France*, xv, 30, pp. 1058–1063, 1929.

Particulars are given of the writers' experiments in the control of various plant diseases by means of certain organic dyes with the addition of adhesive substances.

The toxicity of the dyes was first tested in the laboratory on agar cultures of *Rhizopus nigricans* and *Penicillium glaucum*, both more resistant to chemical action than any of the fungi on which the subsequent field experiments were conducted. These included powdery mildew of peas (*Erysiphe polygoni*), rose mildew (*Sphaerotheca pannosa*), oak mildew (*Microsphaera quercina*), hydrangea mildew (*E. polygoni*), vine mildew (*Oïdium*) [*Uncinula necator*]. The hyphae and spores of all these organisms were immediately stained and destroyed by solutions of auramine OO and violet 5 BO (1 in 1,000) with the addition of a suitable adhesive, e. g., saponin. *U. necator* was also killed by rhodamine 6 G, phosphine, and other preparations used in recent experiments in Gard and Île-de-France. Downy mildew of the vine (*Plasmopara*) [*viticola*] proved somewhat less amenable to these treatments than the above-mentioned fungi owing to the persistence of the hyphae after the death of the conidia, but it yielded to two or three applications, according to the severity of the attack. It was found necessary to use the solutions immediately after preparation in order to avoid the flocculation due to the presence of the adhesive, and consequent loss of toxicity.

The success of these experiments encouraged the writers to extend them to certain cereal smuts, viz., wheat bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*), and maize smut (*Ustilago maydis*) [*U. zeae*]. The seed-grain was immersed for two hours in solutions of 1 in 500 or 1 in 1,000 crystal violet [*R.A.M.*, viii, p. 573], auramine, magenta red, phosphine 5 G, phosphine Acr, brilliant green, malachite green, meldola blue, lanasol G green, vesuvine, Victoria blue, chlorantine violet *lumière* RL, 2 RL, 5 BL, chlorantine ruby *lumière* RH, chlorantine brown, and the rhodamines N, B, 2 GH extra, G extra, 2 B, and 3 B. None of these substances adversely affected the germination of the seed-grain, which was, however, reduced in varying degrees by treatment with night blue, rhodamine 3 G, 3 B extra, 6 G extra, etc. One per cent. copper sulphate, however, caused a heavier reduction of germination than any of the dyes. The spores of *T. caries* and *T. foetens* were absolutely destroyed by phosphine 5 G, auramine G, and auramine OO (1 in 1,000). Violet 5 GO, lanasol G green, brilliant green [loc. cit.], and malachite green also exercised a toxic action on the spores but failed to inhibit germination completely. The rhodamine solutions were less efficacious, 10 per cent. of the spores remaining viable after two hours' immersion. Picric acid (1 in 1,000), dinitrocresolate of soda (1 in 3,000), and paranitrophenyl (1 in 1,000) were ineffective. The toxic action of copper sulphate (1 in 1,000) was approximately equivalent to that of auramine OO.

[A discussion of these results follows on pp. 1063–1066.]

VIALA (P.). **Les matières colorantes contre le mildiou et l'Oïdium.** [Colouring matters for the control of mildew and *Oidium*.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 1, pp. 42–45, 1930.

While fully appreciating the value of Truffaut's and Pastac's laboratory investigations on the control of downy mildew and *Oidium* of the vine [*Plasmopara viticola* and *Uncinula necator*]

by means of chemical dyes [see preceding abstract], the author points out that these treatments are purely of a curative order and cannot replace the regular applications of copper mixtures aiming primarily at the prevention of infection. There is no immediate prospect of substituting one of these relatively inexpensive materials for copper sulphate.

PASINETTI (L.). **Contributo allo studio delle sostanze anticrittogamiche (Esperienze col Fideol N. 1).** [A contribution to the study of fungicidal substances. (Experiments with Fideol No. 1.)]—*Riv. Pat. Veg.*, xix, 9–10, pp. 193–214, 1 pl., 1929.

A full account is given of tests conducted near Milan with a new disinfectant, 'fideol I', manufactured by the Società F.I.D.E. and containing among other substances formaldehyde, mercuric chloride, and alcohol, to ascertain its effects upon the germinative power of the seed of wheat, maize, barley, oats, beets, and runner beans [*Phaseolus multiflorus*] and its fungicidal power against the spores of *Ustilago tritici, U. maydis* [*U. zeae*], and *Tilletia tritici* [*T. caries*].

The [tabulated] results showed that with all the seeds used, immersion for 7 or 15 minutes in an aqueous solution of fideol I at concentrations of 0·5, 1, and 2 per cent. produced no deleterious effect upon the germinative power, which was even better than in the case of seeds treated with other disinfectants in general use. The spores of all the fungi named were killed completely by 15 minutes' immersion in a 2 per cent. solution, or by 7 minutes immersion in a 4 per cent. solution of this product.

FRIEDRICHS (G.). **Der Trockenbeizer für Dauerbetrieb 'Gross-Tillator-Hoechst'.** [The dusting apparatus for continuous work 'Gross-Tillator-Hoechst'.]—*Deutsche Landw. Presse*, lvi, 52, p. 743, 1929.

The construction and application of the Gross-Tillator-Hoechst (I. G. Farbenindustrie A. G., Hoechst) dusting apparatus are fully described. The machine is stated to have given excellent results in the treatment of cereal seed-grain with tillantin, hafer-tillantin, ceresan, and abavit B, and is also adapted for the disinfection of beet seed-clusters. The mixing-drum is so constructed that each hundredweight of seed undergoes two minutes' treatment.

VAYSSIÈRE (P.). **La protection des cultures en Afrique du Nord et dans les colonies.** [The protection of economic crops in northern Africa and the colonies.]—*Agron. Colon.*, xviii, 141, pp. 257–264, 1929.

Brief details are given of the official plant protection services established by the French Government in Algeria and Morocco. In the former country the service dates from 1914, since when its scope has been enlarged, the staff now numbering 22, including a director with three chief and two assistant experts. The administrative headquarters are at Algiers and there are disinfection stations here and at three other ports. Among the regulations governing the importation of seeds one requires that even when

forage seeds are accompanied by a certificate issued by the phytopathological service of the country of origin a specimen of 100 gm. per 100 kg. must be sent to the official testing station for examination, after which importation may or may not be permitted.

In Morocco a similar service was established in 1927, three district inspectors having been appointed provisionally, this number to be subsequently doubled, while three plant disinfection stations have also been set up. The search for and identification of the parasites of economic crops are actively prosecuted and complete records made locally, copies being sent to headquarters and Paris.

The official forms used in reporting diseases and pests are described and reproduced.

Morstatt (H.). **Krankheiten und Schädlinge der tropischen Kulturpflanzen und deren Bekämpfung.** [Diseases and pests of tropical cultivated plants and their control.]—*Der Tropenpflanzer*, xxxii, 12, pp. 491–500, 1929.

A brief general survey, illustrated by some concrete examples, is given of the methods adopted by various European countries and the United States for the protection of their most important colonial crops against fungous diseases and insect pests [cf. *R.A.M.*, viii, p. 455]. Some details are also given concerning the use of various standard disinfectants, the different modes of application, modern developments in the construction of apparatus, and the like.

Jaczewski (A. A.). Современное положение фитопатологии у нас и заграницей. [The present position of phytopathology in U.S.S.R. and abroad.]—Pamphlet issued by *State Inst. of Exper. Agron.*, Leningrad, 23 pp., 1929.

In this booklet the author gives a brief historical outline of the development of plant pathology, as a separate branch of science, with special reference to Russia. He points out the great attainments already achieved in the knowledge of the more important diseases of cultivated crops, and indicates some general lines for further work, stressing the necessity for international co-operation in a question of such an enormous and world-wide economic interest. Illustrations are given of the results so far obtained in the study of the biology and control of the chief parasitic troubles of the main crops, such as cereals, potatoes, tobacco, and the like. A discussion is also included of the organization and working of phytopathological centres in Europe and in the United States of America and Canada.

La Garde (R. V.). **Non-symbiotic germination of Orchids.**—*Ann. Missouri Bot. Gard.*, xvi, 4, pp. 499–514, 1 pl., 1929.

A description is given of asymbiotic germination experiments which were conducted in 1927 with seeds of three named *Cattleya* hybrids grown at the Missouri Botanical Garden. Satisfactory germination was obtained in various combinations of mineral salts with sugar. Of the sugars tested maltose was found to be the most favourable for the germination and growth of the seedlings,

followed in descending order by levulose, glucose, and saccharose. When grown on the nutrient media without the addition of sugar, the seeds produced a very weak growth and were in a dying condition at the end of the experiments, while on the media containing sugar the seedlings were well developed and healthy.

The experiments also showed that the hydrogen-ion concentration of the medium is of considerable importance in germination, the optimum value lying between P_H 4·8 and 5·2. At P_H 5·6 or above the germination and growth were retarded and chlorosis occurred in most cases. Glucose and sucrose proved to be the least favourable sources of carbohydrate, since the seedlings developed more slowly and chlorophyll was formed less rapidly, even at the most favourable P_H values, when these were used.

CARBONE (D.) & ARNAUDI (C.). **L'immunità nelle piante.** [Immunity in plants.]—274 pp., 3 col. pl., 42 figs., Milan, Monografie dell' Istituto Sieroterapico Milanese, 1930.

In this monograph the authors give a detailed account of their researches, conducted at the Institute of Serotherapy, Milan, into various aspects of plant immunity [cf. *R.A.M.*, viii, pp. 116, 456, 803], with special reference to the analogies existing between this and animal immunity. The work comprises chapters (to each of which a bibliography is appended) on immunity in animals, inherent immunity in plants, acquired immunity in plants, humoral factors affecting immunity, and practical considerations.

It is pointed out that the processes involved in inherent immunity in plants and animals run on parallel lines, this being seen in phagocytism by fixed cells (particularly evident, among animals, in the invertebrates and certain insect species), the formation of isolating barriers (connective tissue in animals, cork layers in plants), certain nuclear deformations, the production of polynucleate giant cells, hypersusceptibility leading to immunity, and the existence of apparently healthy carriers. Mithridatism [habituation to poisons] in animals may perhaps be analogous to acquired immunity in plants; immunity may also be due to super-infection. Evidence exists which points to the specific nature of active, acquired immunity in plants and animals, while in both some processes are common to inherent and acquired immunity alike; in plants this is seen in the nuclear reactions and the inhibiting action exercised by the plant juices on the germination of the spores of a parasitic fungus. Further, plants may also show a passive immunity demonstrable, however, only by means of sera obtained from immunized animals. These and other considerations lead the authors to conclude (with reservations) that a closer connexion exists between plant and animal immunity than has hitherto been generally recognized.

HAYES (H. K.). **Breeding disease-resistant varieties of crop plants.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, i, pp. 137–148, 1929.

The author discusses in semi-popular terms the genetic phases of disease resistance in crop plants with special reference to co-operative breeding studies carried out in recent years at Minnesota

[cf. *R.A.M.*, iv, p. 727] in connexion with flax wilt (*Fusarium lini*), black stem rust of wheat (*Puccinia graminis tritici*) and oats (*P. graminis avenae*), the resistance of oats to smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) and that of barley to *Helminthosporium sativum*.

An extensive bibliography is appended.

THOMAS (H. E.). **Studies on the nature of host resistance to Armillaria mellea.**—Abs. in *Phytopath.*, xix, 12, pp. 1140–1141, 1929.

The mode of entry and subsequent development of *Armillaria mellea* have been investigated in relation to various susceptible and resistant roots and tubers, including walnut (*Juglans regia*), peach, cherry, pear [*R.A.M.*, ii, p. 481; v, p. 37], carrot, parsnip, dahlia, and potato. Invasion of the roots is effected by the direct penetration of a branch of the parent rhizomorph through the healthy cork layer of the host, irrespective of the resistance or susceptibility of the latter. In susceptible roots the rhizomorphs make rapid growth and cause general destruction of the host tissue, while in resistant ones the fungus, though readily gaining admission, is unable to establish itself. Such roots are only slightly attacked and any wounds thus formed are quickly healed. There appears to be little correlation between structural or morphological host differences and resistance to *A. mellea*, which seems to be in the nature of a vital, antagonistic interaction between host and parasite.

WELLENSIEK (S. J.). **De invloed van poottijd en rijafstand op de verspreiding van Aardappel-virosen.** [The influence of planting time and row distance on the spread of Potato viruses.]—*Landbouwkundig Tijdschr.*, xli, 497, pp. 641–648, 1929. [English summary.]

In an investigation, conducted at Wageningen, Holland, on the influence of planting time and row distance on the spread of potato viruses [*R.A.M.*, viii, p. 457], the tubers were cut into four parts, each of which was planted in a separate plot at different times and in rows at varying distances apart. The effect of planting time was studied in plots consisting of four rows of 24 plants each, plants 2 and 3 of rows 2 and 3 being mosaic-diseased and serving as sources of infection. The healthy plants were Schotsche Muis [Duke of York] and the mosaic ones Eigenheimers. The influence of row distance was investigated in 2 groups of 4 plots each, each plot comprising 5 rows of 28 plants, the second and thereafter every fifth plant of rows 2 and 4 acting as sources of mosaic infection; the row distances in the plots were 30, 60, 90, and 120 cm., respectively. One set of four plots was earthed up and not the other. The progeny of each individual plant was inspected to determine whether infection had occurred or not.

The results of this investigation [which are discussed and tabulated] showed that the total spread of disease was much greater in 1924 and 1926 than in 1925. In 1924 the incidence of infection in the progeny of plants from tubers planted on 16th June was 93·22 per cent. compared with 9·46 in those from tubers planted

on 17th April. In 1926 the incidence of infection in the progeny of plants from tubers planted on 24th May was 60·46 per cent. compared with 46·51 per cent. in those from tubers planted on 12th April, the dates of lifting being 2nd September and 15th August, respectively. The spread of disease was favoured by an increase in the distance between the rows (from 26·66 per cent. in rows 30 cm. apart to 55·75 per cent. where the distance was 120 cm. in 1926). No difference was observed between the rate of spread of the disease in the same row as compared with spread to different rows. This is in contradiction to the results obtained by Whitehead in Wales [ibid., iii, p. 416] and van der Goot in Java [ibid., iv, p. 694]. Earthing up was not found to exercise any effect on the incidence of virus diseases. Attention is drawn to the desirability of conducting field experiments on virus diseases over a period of several consecutive years, since in years of small total spread no marked differences occur.

Oldaker (C. E. W.) & Dowson (W. J.). **Potatoes. Virus disease and clean 'seed'.**—*Tasmanian Journ. of Agric.*, i, 1, pp. 14–18, 3 figs., 1929.

After giving brief popular descriptions of the chief potato virus diseases (rugose mosaic, common mosaic, and leaf roll) prevalent in Tasmania and which have in recent years considerably reduced the yields, the authors detail the methods to be followed for the establishment at higher altitudes of stud-plots for the production of clean seed tubers. It is pointed out that in Scotland the process recommended has led to the practical elimination of virus diseases within 10 years. The main point is that all off-type or diseased plants should be carefully rogued out of the plots as soon as they appear, and that the seed tubers should be dug out early, just as the tops turn yellow.

Jones (W.) & Rawlins (T. E.). **Influence of spindle tuber disease on the physiology of the Potato tuber.**—Abs. in *Phytopath.*, xix, 12, p. 1137, 1929.

Most living tissues of healthy potato tubers were found to be more resistant to the passage of an electric current than similar tissues of potatoes affected by spindle tuber [*R.A.M.*, ix, p. 263]. Such differences, however, were insufficient to warrant the use of this method for the separation of diseased from healthy tubers. The juice of sound tubers was more resistant to the passage of electricity than that of diseased ones, indicating a higher concentration of electrolytes in the latter. No significant difference was detected in the dry weight of the ash content of diseased and healthy tubers.

Binkley (A. M.). **Transmission studies with the new psyllid-yellows disease of Solanaceous plants.**—*Science*, N.S., lxx, 1825, p. 615, 1929.

Between 1926 and 1928 a destructive disease of potatoes, thought to be associated with the tomato psyllid (*Paratrioza cockerelli*) and, therefore, termed psyllid-yellows, was observed in Colorado [*R.A.M.*, viii, p. 633 and next abstract]. The characteristic symp-

toms of the disease, which appears to differ from any hitherto described on potato or tomato, are the upward cupping of the leaves and a marked stunting of the plant. Though other Solanaceous plants have also been found to be affected, the chief damage occurs on potatoes and tomatoes.

Experiments indicate that the injury is not produced by the feeding of the psyllid nymph alone and that the injurious factor is not transmitted to the progeny through the egg. Eggs laid by viruliferous psyllids on diseased plants, grown under caged conditions, were artificially hatched under sterile conditions. The nymphs thus secured were placed on healthy tomato plants and allowed to feed until they reached maturity, and in no case was any injury detected on the plants.

The disease was transmitted in a relatively short time (7 to 10 days) from affected to healthy plants by viruliferous nymphs under caged conditions. It has also been transmitted from diseased tomato to healthy potato plants and from potato to tomato. Other hosts successfully inoculated were the common garden pepper [*Capsicum annuum*], eggplant, and Jerusalem cherry [*Solanum pseudo-capsicum*]. Needle inoculation with extracted and filtered juice from diseased plants failed to give satisfactory results.

The scale-like nature of the nymph, its habit of feeding on the under side of the leaves, and the further protection afforded by the upward cupping or rolling of the foliage, render control by spraying and dusting a very difficult problem. Owing to its destructive nature and the difficulties of control, psyllid yellows, which is thought to belong to the virus group of diseases, may well become one of the most important diseases of Solanaceae in the intermountain region of the United States.

Shapovalov (M.). **Tuber transmission of psyllid yellows in California.**—Abs. in *Phytopath.*, xix, 12, p. 1140, 1929.

Psyllid yellows of potatoes, associated with the tomato psylla (*Paratrioza cockerelli*) [see preceding abstract], was first discovered in California in the autumn of 1928. A mixed lot of tubers, taken from different hills in a badly diseased field and planted outdoors and in pots at Riverside, yielded plants in part affected by yellows, while others showed mosaic symptoms, and the remainder were free from attack. Another lot, comprising the progenies of several hills kept separately, showed various stages of the disease in plants grown from tubers of different hills. It was further observed, in the spring of 1928 [? 1929], that potato-fields in the psyllid-infested areas showed a considerable amount of disease even in the absence of *P. cockerelli*. The symptoms of psyllid yellows were much more marked in the dry, hot regions of the interior than on the coast or under artificial shading.

MacMillan (H. G.) & Schaal (L. A.). **A pathological feature of flea-beetle injury of Potato tubers.**—*Journ. Agric. Res.*, xxxix, 11, pp. 807–815, 4 figs., 1929.

In giving a description of the damage done to potato crops in the Greeley district of Colorado by the potato flea-beetle (*Epitrix cucumeris*), the author states that the larvae render the

tubers susceptible to attacks of the common scab organism (*Actinomyces scabies*). Experiments made at the Colorado Potato Experiment Station, Greeley, showed that a measure of protection against scab may be attained by treating the seed tubers with mercury compounds; potatoes raised from such seed are usually free from scab, although the treatment does not seem to reduce the attacks of the larvae to any apparent degree.

Köck [G.]. **Bodendesinfektionsversuche zur Bekämpfung des Kartoffelkrebses.** [Soil disinfection experiments for the control of Potato wart.]—*Oesterr. Zeitschr. für Kartoffelbau, 1929*, 4, pp. 71–72, 1929.

Further experiments in the control of potato wart [*Synchytrium endobioticum*] in Styria (Austria) [see following abstracts] by means of soil disinfection with formaldehyde (1 per cent.), sulphite lye (5 per cent.), sulphur, and caustic lime (each used at the rate of 5 kg. per plot of 20 sq. m.) were entirely unsuccessful [*R.A.M.*, viii, p. 262]. Notwithstanding the abnormally low temperatures prevailing during the winter of 1928–9, the virulence of the fungus was not in the least reduced. The protracted cultivation of the highly susceptible Prof. Wohltmann variety in infested soil led to attacks of exceptional severity.

Köck [G.]. **Das Verbot der Einfuhr von Speisekartoffeln aus Oesterreich nach Italien.** [The prohibition of import of table Potatoes from Austria into Italy.]—*Oesterr. Zeitschr. für Kartoffelbau, 1929*, 4, pp. 72–74, 1929.

On 25th January, 1928, the Italian Ministry of National Economy gave temporary permission for the importation of potatoes (prohibited under the Decree of 3rd March, 1927) from Austria into Italy. This permission has now been withdrawn on account of the alleged prevalence of potato wart [*Synchytrium endobioticum*: see next abstract] in Austria, and also because certain Austrian firms are reputed to have exported Polish and Czecho-Slovakian potatoes into Italy, under the auspices of the Federal Institute for Plant Protection, as original home-grown seed [cf. *R.A.M.*, viii, p. 664]. Strong exception is taken to this action on the part of the Italian Government, since no proof of the justice of these allegations is forthcoming, and moreover, the quality of the Austrian potatoes is superior to that of the Hungarian, which may now be freely imported into Italy.

Köck [G.]. **Der Kartoffelkrebs in Kapsenberg. Neue Kartoffelkrebsherde in Steiermark. Das erste Auftreten des Kartoffelkrebses in Oberösterreich.** [Potato wart in Kapsenberg. New Potato wart centres in Styria. The first occurrence of Potato wart in Upper Austria.]—*Oesterr. Zeitschr. für Kartoffelbau, 1929*, pp. 77–78, 1929.

In spite of instructions to the contrary, a number of smallholders in the Kapsenberg district of Styria are continuing to grow potatoes in soil infested with wart disease [*Synchytrium endobioticum*: see preceding abstracts]. Steps will be taken to enforce compliance with the regulations. Two new localities in

Styria have been found to be infested by *S. endobioticum*, bringing the total to five. The disease has also been observed in the Linz district of Upper Austria [*R.A.M.*, viii, p. 261].

PITTMAN (H. A.). **'Early blight' or 'leaf spot' and the Macrosporium 'storage disease' of Potatoes.**—*Journ. Dept. of Agric. Western Australia*, vi (2nd Ser.), 4, pp. 544–552, 6 pl., 1929.

The results of the preliminary investigation briefly reported in this paper have shown that early blight (*Alternaria solani*) of potatoes is chiefly responsible for the severe storage rot which annually causes heavy losses to potato growers in Western Australia. This indicates that the disease is among the most dangerous troubles of the crop in that State. In Western Australia epidemics of early blight usually occur only shortly before the harvesting of the tubers, for which reason the designation early blight is a misnomer and the name *Macrosporium* (*Alternaria*) blight is preferable.

In giving a popular description of the symptoms in the field and of the storage rot, as well as of the morphology and life-history of the causal organism, it is stated that a preliminary study of *A. solani* confirmed the existence in it of numerous, more or less ill-defined strains, which showed the same variations in appearance, chromogenicity, stability of type, and pathogenicity to potato leaves and tubers as noted by Bonde [*R.A.M.*, viii, p. 737]. In Western Australia *A. solani* has been so far found only on two commercial varieties of potatoes, namely, Manistee (imported from Victoria), and Delaware, which is apparently identical with, or a strain of, the American variety of the same name. The only other hosts of interest to potato growers in Western Australia are stated to be the tomato, eggplant, and the common nightshade (*Solanum nigrum*).

The control measures recommended are spraying or dusting the crop with copper fungicides, late harvesting of the tubers, sanitation of the fields, crop rotation, and seed tuber disinfection.

CHEAL (W. F.). **A further note on the black dot disease of Potatoes.**—*Gard. Chron.*, lxxxvi, 2243, 1 fig., 1929.

King Edward potato plants grown from tubers inoculated with *Colletotrichum atramentarium* [*R.A.M.*, ix, p. 15] at Kirton, Lincolnshire, failed to exhibit the symptoms of weakness and stunting ascribed to this fungus by Dickson in Canada [ibid., v, p. 447]. This result is considered as of some importance in view of the growing tendency to implicate *C. atramentarium* in the etiology of 'potato sickness' [ibid., ix, p. 125].

MARTIN (W. H.). **Sweet Potato disease control studies.**—*Forty-ninth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1928*, pp. 257–262, 1929. [Received February, 1930.]

Further investigations on the control of stem rot of sweet potatoes [*Fusarium hyperoxysporum* and *F. batatatis*: *R.A.M.*, viii, p. 59] confirmed the results of previous trials as regards the

comparative resistance of White Yam and Red Brazil, and the high productivity of the Priestly and Fox strains of Yellow Jersey and the Big Stem Jersey and Gold Skin varieties. As before, the effects of multiple planting were beneficial. Some control was given by sprout treatment with semesan bel (hydroxymercurichlorophenol 10 per cent.), semesan jr. (hydroxymercurichlorophenol sulphate 10 per cent.), and bayer dip dust (hydroxymercurichlorophenol sulphate 6 per cent., hydroxymercurinitrophenol sulphate 2 per cent.). Scurf [*Monilochaetes infuscans*] and black rot [chiefly *Ceratostomella fimbriata*: see above, p. 290] were well controlled by sprout treatment with mercuric chloride (1 in 1,000 for 10 minutes) and semesan jr. (1 in 20, instantaneous dip).

VOLLEMA (J. S.). **Meeldauw en bemesting.** [Mildew and manuring.]—*De Bergcultures*, iii, 77, pp. 1975–1977, 1929.

The results of experiments carried out to determine the effect of systematic manuring with appropriate quantities of synthetic fertilizers on the incidence of rubber mildew [*Oidium heveae*: *R.A.M.*, ix, pp. 56, 128] in Java are briefly described. It was found that the application of a combination of nitrogen, phosphoric acid, potash, magnesium, and lime not only failed to prevent the occurrence of mildew, but actually increased its incidence by retarding the period of normal leaf fall, so that the new foliage was formed during the critical time for attack by the fungus [see next abstract]. It is concluded that systematic manuring and other cultural measures are only likely to prove valuable in estates where mildew is held in check by spraying.

BOBILIOFF [W.]. **Resultaten van de meeldauwproeven op Pondok Gedeh.** [Results of the mildew experiments at Pondok Gedeh.]—*De Bergcultures*, iii, 77, pp. 1977–1982, 1 graph, 1929.

The conditions prevailing in *Hevea* rubber plantations during the formation of new foliage after normal leaf fall are highly favourable for infection by mildew (*Oidium*) [*heveae*: *R.A.M.*, viii, p. 461 and preceding abstract]. After the attack is over there is little outward evidence of the presence of the fungus on the trees, but a close examination of the young shoots at the tips of the branches reveals traces of mildew. A study [the results of which are expressed in graphic form] of the percentage of shoots on the trees at different times of year showed that during November 90 per cent. of the trees bear young shoots; after this the incidence declines until only 30 per cent. were counted between 27th April and 10th May. The subsequent leaf fall is followed by a continuous rise in the number of trees bearing shoots, amounting to 100 per cent. by the end of September. The new shoots constitute a good medium for the fungus, and this explains the simultaneous increase in their number and the incidence of infection. The smallest number of diseased trees (5 per cent.) was counted in February and the largest at the end of July, when practically all those with new shoots were infected.

Attention is drawn to the fact that spraying against mildew should begin immediately the so-called 'imperceptible' infection

on the shoots is observed to be reaching a climax. This type of infection, so called to distinguish it from the conspicuous spotting of the older leaves, can only be detected by removing the shoots (which mostly occur near the tops of the trees) and inspecting them closely for traces of mildew. It was found that two men can easily examine 100 trees daily in this way. It was observed in the recent dusting experiments that the initial decrease of infection after the application of sulphur is followed by a rise between the 10th and 17th day, so that in practice not more than a fortnightly, or at most a three-weekly, interval should elapse between each application. The 'imperceptible' infection increased suddenly at the end of June and leaf fall culminated at the end of August, necessitating four to five applications of sulphur over the chief period of activity. The amount of sulphur used in the experiments under discussion was over 150 kg. per hect., but the writer is of opinion that such a large quantity is superfluous, and that 75 kg. per hect. would probably suffice. None of the other dusts tested showed any superiority over sulphur, the retention of which is advised on account of its availability and cheapness in Java [ibid., ix, p. 128]. The best time of day for dusting was found to be from 7.30 to 8 a.m. Dusting takes place during the dry season and the few showers occurring at this time were not found to disperse the sulphur from the leaves or increase the incidence of mildew. The necessity of dusting slightly infected plantations, in order to prevent the spread of mildew from the latter to the neighbouring treated ones, is frequently urged, but the writer has found that this mode of transmission is very slow and that only the rows of trees in immediate proximity to the source of infection contract the disease.

De Vries (O.). **Meeldauwbestrijding van uit vliegtuigen.** [Mildew control from aeroplanes.]—*De Bergcultures*, iii, 77, pp. 1982–1985, 1929.

Notes are given on the results of some preliminary experiments in the control of rubber mildew [*Oidium heveae*: see preceding abstracts] in Java by dusting with sulphur from aeroplanes. The disease was well controlled by this method, the aeroplanes making three to five flights of 20 to 30 minutes each morning at a speed of about 130 km. an hour. It is estimated that one aeroplane, using some 1,200 kg. of sulphur, does the work of seven motor apparatuses in an eight-hour day. The cost of this method of treatment (roughly Fl. 1·50 per 10 kg. sulphur) is somewhat higher than that of dusting with motor apparatus, but should not be by any means prohibitive for use on a large scale.

Eaton (B. J.) & Fullerton (R. G.). **A study of the effect of damp storage on raw Rubber.**—*Rubber Res. Inst. of Malaya, Bull.* 2, 26 pp., 1 graph, 1929.

A full account is given of investigations conducted under laboratory conditions in Malaya to determine the relation between mould development and moisture absorption by rubber kept in damp storage, and the effect of mould development on the loss of weight and on the nitrogen content of the raw rubber. Tests

were also made of the comparative fungicidal value of paranitrophenol [*R.A.M.*, v, p. 694; viii, p. 600] and trichlor-sodium phenate.

The results [which are tabulated and discussed] showed that smoked sheet and air-dried sheet rubber when allowed to absorb moisture almost invariably develop moulds from spores which contaminate the latex after tapping. The absorption of moisture by raw rubber when stored in an atmosphere of high humidity was found to reach a maximum after a few days. When moulds developed, a loss of weight occurred and continued to increase for a long period; the maximum loss amounted to about 17 per cent. in some 15 months' damp storage. This shows that the hydrocarbon-caoutchouc is attacked, as first grade raw rubber does not contain over 5 to 6 per cent. of non-caoutchouc constituents. The losses occurred in a gaseous form, none of the samples being rewashed or treated with any solvent.

When sheet rubber was well smoked moulds developed only after a long period.

The addition to latex of paranitrophenol or the subsequent treatment of the freshly machined sheet with a dilute solution of this chemical considerably retarded but did not inhibit the growth of moulds.

As trichlor-sodium phenate had been stated by the manufacturers to be from five to ten times as efficient a fungicide as paranitrophenol when tested on pure cultures of a number of fungi commonly attacking stored rubber, comparative tests were made on moulds isolated from two samples of smoked sheet. The fungi isolated comprised three species of *Penicillium* (one of which was probably *P. luteum*), four species of *Aspergillus* (probably *A. ochraceus*, *A. terreus*, *A. niger*, and *A. versicolor*), and a black *Torula*. The [tabulated] results showed that while only 0·005 per cent. of trichlor-sodium phenate was necessary to suppress the fungi, 0·02 per cent. of paranitrophenol was required to effect the same result. Further tests [details of which are given] demonstrated that the reduced efficiency of trichlor-sodium phenate in estate practice as compared with paranitrophenol is due to the effect of the dilute acid used as a coagulant, which converts this compound into the highly volatile trichlor-phenol.

The development of the chromogenic organisms producing spot disease [caused mainly by bacteria and species of *Aspergillus*, *Penicillium*, and *Fusarium*: ibid., viii, p. 524] in pale crepe rubber causes a loss of weight similar to, but less than, that caused by the moulds which develop in smoked or air-dried sheet.

The growth of moulds causes no loss in the nitrogen content of the rubber, although the nitrogenous constituents may be changed in character by the moulds.

The development of the defect known as 'white or virgin' streak was found to be due to allowing the rubber to become damp, and not to the rubber being insufficiently dried during smoking; dry, unsmoked sheet allowed to become damp becomes white and opaque throughout.

In the smoke-drying of rubber as carried out during recent years, the wood fuel is too completely combusted, producing a smoke

which contains little creosote or other antiseptic constituents, this observation applying only to the effect of the smoking process on mould development and not to its effect on any intrinsic properties of the rubber.

TACKE (B.), ARND (T.), HOFFMANN (W.), & POOK (A.). **Die Urbarmachungskrankheit oder Heidemoorkrankheit.** [The reclamation or heath moorland disease.]—*Mitt. Ver. Förderung der Moorkult. im Deutschen Reiche,* xlvii, 12, pp. 247–253, 4 figs., 1929.

Attention is drawn to the conflicting nature of the results obtained by the application of copper sulphate for the control of the so-called reclamation disease of oats [*R.A.M.*, viii, p. 751] in the moorland soils of Germany. Whereas in some field tests the crops benefited in a marked degree by treatment with copper sulphate, in a series of pot experiments with this compound applied at the rate of 100 kg. per hect. the effects were negligible. The slightly increased yield of the treated plants is attributed purely to the stimulatory action of the copper sulphate. The effect of manganese sulphate (100 kg. per hect.) and urban refuse (400 cwt. per hect.) was also inconsiderable in pot tests. The addition of 50 or 100 gm. of gliedin [ibid., vii, p. 270] per pot failed to cause any injury or reduction of yield, nor could the alleged toxic crystalline substance analysed by Smith [loc. cit.] be extracted with alcohol in the authors' experiments.

HOCQUETTE (M.). **Découverte du 'canker' dans les Houblonnières de Flandre.** [Discovery of 'canker' in the Hop gardens of Flanders.]—*Comptes rendus Soc. de Biol.*, xcii, 36, pp. 1025–1026, 1929. [Issued January, 1930.]

Tige verte hops in some Flanders gardens, especially at Boeschèpe, were observed in August, 1929, to be suffering from canker, manifested by stunting, desiccation, and an abnormal thickening of the bases of the stems. The dead tissues were found to be invaded by a septate, intra- and extracellular mycelium which also penetrated the living cells of the adjacent parts. Elongated, fusiform, slightly curved, 5-septate conidia, measuring 28 to 35 by 4 to 5·5 μ, were formed on the whitish pustules covering the basal tumours. The fungus is evidently identical with that detected by Millasseau on English hop cuttings in France, viz., *Fusarium roseum* (of which the perfect stage is *Gibberella saubinetti*) [*R.A.M.*, viii, p. 264]. The eradication and destruction of infected material is recommended.

BELL (A. F.). **Work of the Division of Pathology.**—*Twenty-ninth Ann. Rept. Queensland Bureau of Sugar Exper. Stat.*, pp. 34–37, 1929.

In this report the results are summarized of disease surveys made in ten of the principal sugar-cane growing areas of Queensland to assist farmers in obtaining supplies of healthy canes for planting, while notes are also given on preliminary trials of resistance to gumming disease [*Bacterium vascularum*] which remains the chief pathological problem in this crop in Southern Queens-

land, where it is slowly spreading into localities that were hitherto clean.

Top rot [*R.A.M.*, viii, p. 666] and spindle top (? *Sclerotium* spp.) [ibid., vii, p. 600] were much more prevalent than usual during 1929 in the extreme north of Queensland, owing, probably, to an exceptionally dry spring followed by heavy and prolonged rains. Field observations indicate that both diseases are of economic importance only when unfavourable conditions have retarded the early growth of the cane.

Sour rot was rather common in the Lower Burdekin district, especially on H.Q. 426 and to a less extent on E.K. 28; during July and August it could readily be found in nearly every field of the former variety. The external symptoms are essentially similar to those of severe red rot [*Colletotrichum falcatum*]; internally, a rot begins with a general yellowish discoloration of the storage tissue, usually restricted to the upper part of the stem. The tissue gradually turns brown, and a sour rot with a faintly disagreeable odour develops. The rot extends outwards to the rind and may, exceptionally, reach the base of the stalk; later, the storage tissue becomes pithy, and finally large longitudinal cavities are produced.

Inoculation tests on P.O.J. 2878 and other cane varieties showed that strains of *Fusarium moniliforme* [*Gibberella moniliformis*] capable of causing pokkah-boeng [ibid., viii, p. 670] were present in Australia prior to the introduction of P.O.J. 2878 from Java. It is therefore probable that this variety will contract the disease when field plantings are made.

A brownish rot at the base of the stool, caused by a species of *Corticium*, was occasionally reported. In every instance the disease was present on new land where the tree stumps were still standing, and the fungus had evidently passed from these to the cane.

ORIAN (G.). **Les maladies de la Canne à Maurice.** [Sugar-Cane diseases in Mauritius.]—*Rev. Agric. de l'Île Maurice, 1929*, 48, pp. 206–210, 1929.

Brief notes are given on the occurrence and severity in 1929 of the principal sugar-cane diseases in Mauritius. Pineapple disease [*Ceratostomella paradoxa*] appears to have been locally more severe than in 1928; some plantings were almost completely destroyed by this disease, a result in part attributed to the poor quality of setts used by many planters. Morve rouge [red rot, *Colletotrichum falcatum*] is not generally of great economic importance, since the chief sugar-cane varieties in use in Mauritius, with the exception of D.K. 74 and M. 131, are fairly resistant to it; a certain degree of susceptibility was also observed, however, in the R.P. 6 variety. Gummosis [*Bacterium vascularum*] and leaf scald [*Bact. albilineans*: *R.A.M.*, ix, p. 270] are fairly common; the varieties D. 109, M. 131, and M. 55 are very susceptible to leaf infection, while the white Big Tanna, which is very resistant to this form, is very liable to stem infection, and D.K. 74 is resistant to both. Smut [*Ustilago scitaminea*] was much less prevalent than in 1928; along the littoral it chiefly affects the

varieties D.K. 74, M. 131, and R.P. 8 from November to March or April. The white Big Tanna variety suffers from an undetermined root rot in wet clay soils; M. 55 suffered in 1928 from a similar disease in a field, in which certain pure lines of M. 131 remained immune and grew well. In the north of the island D. 130 continues to be affected with a root rot, which cannot apparently be ascribed to soil conditions.

With reference to the description given by him in a previous paper [ibid., viii, p. 134] of the various stages of 'pokkah-boeng' in Mauritius, the author points out that the condition of the cane tops tentatively described as a stage of the trouble has been since recognized in Cuba by Priode [ibid., viii, p. 337] as distinct from pokkah-boeng and named 'twisted top'; it is also believed to be identical with the disease known as 'tangle top' or 'top knot' in Queensland. Cases of true pokkah-boeng (partial rot of the leaves, occasionally followed by a rot of the pith and of the stems) were frequently observed in Mauritius from January to June, 1928, but were considerably less frequent and occurred much later in the season in 1929, probably owing to the dry weather at the beginning of the year [see next abstract]. The varieties M. 522, 94/26, and L.B. 111/14 appear to be susceptible to the disease in the Departmental nurseries, but exhibit a high degree of tolerance to it. A description is given of a peculiar form of inflorescence rot, which, it is believed, may be related to pokkah-boeng. The more or less developed inflorescences rot while still enclosed in the top, the infection then spreads to all the young nodes, to which it remains localized, and numerous adventitious buds are formed on the topmost nodes of the canes. When infection is slight and occurs at the time of formation of the inflorescence, the latter appears to revert to vegetative life, and produces a large number of atrophied, narrow leaves which emerge in a bunch at the top. This condition has been described by Lyon from Hawaii under the name of 'bunch-top'. Cases of this inflorescence rot were very rare in Mauritius in 1928, and only occurred on the white Big Tanna variety; in 1929, however, they were very prevalent, especially on the white Big Tanna, D.K. 74, M. 131, D. 109, and some as yet unreleased nursery varieties. This disease causes very little, if any, damage to the sugar-cane.

Streak disease in Mauritius only occurs on the R.P. 8 variety, which is an importation from Demerara, and is not apparently spreading in the island. The eye-spot disease (*Helminthosporium ocellum*) [ibid., viii, p. 134] is stated to be the most serious leaf disease, especially on the 53/26 and D.109 varieties. The disease has never been observed, so far, to cause a pith rot of the canes.

SHEPHERD (E. F. S.). **Notes supplémentaires sur le 'Pokkah-bong' et autres affections similaires de la Canne à Maurice.** [Additional notes on 'Pokkah-boeng' and other similar diseases of the Sugar-Cane in Mauritius.]—*Rev. Agric. de l'Île Maurice, 1929*, 48, pp. 213–214, 1929.

The discovery in Mauritius of a species of *Fusarium* in the tissues near the growing tip of canes exhibiting symptoms of pokkah-boeng supports the view that this disease is identical with

that described by other investigators and attributed to *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, vii, p. 537 and above, p. 291]. In the author's view, true pokkah-boeng must henceforth be recognized as an infectious disease of the cane tops caused by this species of *Fusarium*. It is pointed out, however, that in Mauritius the fungus has not yet been exactly identified and its pathogenicity has not been experimentally tested.

The abnormal condition described by Orian which is similar to Priode's 'twisted top' [see preceding abstract] is attributed to external factors that bring about an increase in the friction between the opening outer leaves, resulting in the twisting and bending of the whole leaf crown, and in the tearing of the outer leaves under the pressure exerted by the growth of the inner ones. Among the factors that are involved in the production of this condition, certain insects (e. g., thrips) and wind may play a part.

True pokkah-boeng is not sufficiently frequent in Mauritius to necessitate any control measures. It is stated that cuttings taken from healthy portions of infected canes produce healthy plants, and for the most part infected stools rapidly recover. It is best, nevertheless, to remove canes affected with top rot from the fields, since such canes die and are not only useless but offer a danger of infection to the neighbouring plants.

Bibliografia de los principales trabajos relativos al mosaico de la Caña de Azúcar que se han publicado a partir del descubrimiento de la enfermedad hasta el año de 1929. [Bibliography of the principal works relating to Sugar-Cane mosaic which have been published since the discovery of the disease up to the year 1929.]—*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, iii, 5–6–7–8, pp. 186–235, 1929.

From time to time statements appear in foreign scientific literature to the effect that sugar-cane mosaic is present in Mexico, but notwithstanding its occurrence in various adjacent regions no trace of the disease has hitherto been detected by phytopathological experts. It is, however, possible that the condition exists in a form that has escaped recognition, and a fresh tour of inspection of the cane plantations has been organized by the agricultural authorities with a view to settling the question.

A bibliography of 436 titles of papers relating to sugar-cane mosaic published between 1903 and 1929 is given.

Sydow (H.). **Fungi chinenses. Series prima.** [Chinese fungi. First series.]—*Ann. Mycol.*, xxvii, 5–6, pp. 418–434, 1929.

The writer enumerates about 80 fungi submitted to him for identification from the University of Nanking. Fourteen are described as new species, including *Ustilago eleusines* on *Eleusine indica*, characterized by black sori, 2 to 3 cm. long, at first enclosed in a grey membrane which is soon ruptured in narrow strips, and by spherical or sub-spherical to broadly ellipsoid spores, 8 to 11 by 7 to 10 μ, or, occasionally, elongated ones up to 14 μ in length, with a very thin membrane, densely punctate with granular warts. The ears of the host are completely destroyed by the sori of the fungus.

Sideris (C. P.). **Taxonomic studies in the family Pythiaceae.**—Abs. in *Phytopath.*, xix, 12, pp. 1142–1143, 1929.

The genera *Nematosporangium*, *Pythium*, and *Phytophthora* are distinguished by differences in their zoospore-producing organs. Three morphologically separate organs exist, viz., the prosporangium, emission collar, and zoosporangium: the first being a reservoir of the protoplasm for zoospore development; the second constructed for the passage of protoplasm; and the third for the full development and discharge of zoospores. The wall of the zoosporangium [vesicle of most authors] constitutes a part of the so-called ectoplast or protoplasmic membrane of the prosporangium.

On this basis the genera may be differentiated as follows. *Nematosporangium*: nematoid, allantoid, rarely subspherical, intra- and extra-marginal, ill-defined prosporangia; very long emission collar; spherical zoosporangia of variable size; few to many zoospores. *Pythium*: well-defined, lemon-shaped to spherical, mostly extra-marginal prosporangia of variable dimensions; short emission collar; zoosporangia and zoospores as in *Nematosporangium*. *Phytophthora*: prosporangia as in *Pythium*; zoosporangia developing within the walls of prosporangia; emission collar absent or occasionally rudimentary; few to many zoospores.

Species of *Pythium* comprise four sections, viz., (1) those reproducing asexually (by zoospores and conidia); (2) those reproducing sexually (by oospores and conidia); (3) those reproducing by both methods; and (4) those reproducing by conidia alone.

A similar subdivision is proposed for the genus *Phytophthora* [*R.A.M.*, vii, p. 601].

Sideris (C. P.). **Pythiaceous root parasites of various agricultural plants.**—Abs. in *Phytopath.*, xix, 12, p. 1140, 1929.

Studies were conducted [in Hawaii] on the parasitism of various Phycomycetes. Most of the organisms were isolated from pineapples [see above, p. 324], while a few were obtained from spinach, snapdragon [*Antirrhinum majus*], papaw, and castor (*Ricinus communis*). They included 9 species of *Nematosporangium* [see preceding abstract], 10 of *Pythium*, 5 of *Phytophthora*, and 1 sterile Phycomycete. The hosts were planted in sterile soil and inoculated with pure cultures of the different fungi when their roots reached a length of 3 to 4 inches. The dicotyledonous plants, e.g., *Canavalia ensiformis*, cowpea, *Phaseolus aureus*, *Vicia faba*, *Cajanus indicus*, sunflower, potato, and *R. communis*, were susceptible to most species of *Pythium* and some slightly to *Nematosporangium*; whereas such monocotyledons as *Pennisetum barbinode*, sugarcane, maize, wheat, and pineapple were attacked only by *Nematosporangium*. Onions were found to be very resistant to all species of *Nematosporangium* and *Pythium*, but highly susceptible to the five species of *Phytophthora*.

Săvulescu (T.) & Sandu (C.). **Die Erysiphaceen Rumäniens.** [The Erysiphaceae of Rumania.]—Reprinted from *Ann. Scient. Acad. Hautes Études Agron. Bucarest*, i, 82 pp., 24 pl., 1929.

The authors state in their preface that no complete account of

the Rumanian Erysiphaceae has hitherto been published, the information on this group of fungi being confined to a few scattered records [which are cited]. The present study comprises morphological and taxonomic observations on 34 species belonging to eight genera. A key for the determination of the genera, an alphabetical host index, and a six-page bibliography are appended.

Stevens (N. E.) & Shear (C. L.). **Botryosphaeria and Physalospora in the Hawaiian Islands.**—*Mycologia*, xxi, 6, pp. 313–320, 1 fig., 1929.

Brief descriptions and notes are given of one species of *Botryosphaeria*, namely, *B. ribis chromogena* [*R.A.M.*, vi, p. 106], and two species of *Physalospora*, *P. fusca* [ibid., vi, p. 127] and *P. malorum* [*P. cydoniae*], which were collected by the authors in 1927–8 in the Hawaiian Islands. *B. ribis chromogena*, the most abundant of these organisms, was found on 14 different hosts, including mango, guava, and castor. Cultures on cornmeal of all the collections of this fungus produced the pink coloration typical of the currant cane blight fungus in the United States. *P. cydoniae* was collected on *Osteomeles anthyllidifolia*, which is a native rosaceous plant; it agreed in its ascospore measurements with the fungus as found in the eastern United States, but differed in the greater length of its pycnospores.

From none of the ascospore material was it possible to obtain the pycnidial form so frequent in the tropics and known under the names *Diplodia natalensis* or *Botryodiplodia theobromae*. This pycnidial form appears to be rare in Hawaii, as only four collections on *Hibiscus* and *Panax* gave a fungus corresponding to *D. natalensis*.

The paper terminates by general considerations on the distribution in Hawaii of the organisms considered.

Arthur (J. C.), Kern (F. D.), Orton (C. R.), Fromme (F. D.), Jackson (H. S.), Mains (E. B.), & Bisby (G. R.). **The plant rusts (Uredinales).**—v + 446 pp., 177 figs., 8 diags., 1 map, New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1929.

This comprehensive study of the plant rusts (Uredinales), with special reference to their biology, is stated to be based on the outcome of many years' investigations conducted under the direction of the senior author at the Purdue University Agricultural Experiment Station, Lafayette, Indiana. The inception of the work dates from the 'eighties, but the period of greatest activity as regards the study of the rust flora of North America was the last twenty years. The taxonomic results of the work have been published in the seventh volume of the North American Flora [*R.A.M.*, vii, p. 61].

The following aspects of the subject are discussed in a simple, concise, and readable form, dispensing as far as possible with technical terms and explaining them where necessary. (1) The general nature of the rusts, including their life-cycles (illustrated by concrete examples), economic importance, and habitat and distribution. (2) An historical review of the group from remote

antiquity to modern times. (3) Development (ontogenetic and phylogenetic), classification, nomenclature, and taxonomy. (4) Cytology and morphology. (5) Dissemination and geographical distribution, comprising observations on a number of biological and ecological factors, e. g., spore dissemination, climatic zones in North America, general distribution from north to south, distribution of the larger genera, augmentation and simplification of the life-cycle, barriers to distribution, distribution by groups of hosts, and distribution in time (a brief survey of seven fossil rusts found in various parts of Europe, the earliest dating from the Lower Carboniferous period). (6) Physiology, including an account of spore germination, of the factors influencing this process and the development of the germ-tube, and of infection, mycelial development, sporulation, factors affecting the rust indirectly through the host, and secretions and reserve foods. (7) Specialization of rust species (host range, physiological races and forms), rust reaction as a means of classification, nature of resistance and susceptibility, and stability of reaction. (8) Abnormalities and diseases of the rusts, pathological, anatomical, and physiological changes in the host, and pathological injury to animals and man. (9) Economic considerations. (10) Methods of investigation (collection and preservation, technique for microscopical examination, and cultural work and methods).

A 47-page bibliography is appended.

KOTILA (J. E.). **Study of the biology of a new spore-forming Rhizoctonia, Corticium praticola.**—*Phytopath.*, xix, 12, pp. 1059–1099, 5 figs., 1 graph, 1929.

Five isolations from a lucerne plant affected by a spore-forming *Rhizoctonia* [*R.A.M.*, vii, p. 726] yielded in four cases a similar fertile organism. One of the spore-forming cultures was selected for further study and designated R-40, the sterile form being numbered R-43. From numerous other isolations from various plants, three cultures were obtained that resembled the spore-forming *Rhizoctonia* (two from lucerne and one from bean), but only one (R-38 from lucerne roots in Minnesota) produced spores and proved to be identical with the new species in all respects.

The mycelium and sclerotia of the spore-forming *Rhizoctonia* from lucerne resemble those of *C. solani*, but the 1 to 4 sterigmata are unusually long (13 to 26·5 μ, average 18·8 μ), and taper gradually from the point of attachment to the tip, the maximum diameter being about 2·6 μ. The average dimensions of the hyaline basidia are 15·6 by 6·5 μ and those of the hyaline, ovate, apiculate, smooth-walled basidiospores 7·7 by 5·2 μ. The sterigmata (4 to 6 in number) of *C. solani* measure 6 to 10 μ and the basidiospores 8 to 14 by 4 to 6 μ. Thus, while the new fungus must be referred to *Corticium* on account of its resupinate hymenium, glabrous, hyaline basidia, and absence of cystidia, it is evidently distinct from *C. solani* and is therefore designated *C. praticola* n. sp., with an English diagnosis.

Positive results were given by inoculation experiments with *C. praticola* (R-40) under conditions of high humidity, the fungus

being mixed with the sterilized soil of pots containing lucerne seedlings. The perfect stage reappeared on the infected plants.

In addition to Coons's synthetic medium, the following formula was found very suitable for the growth and sporulation of *C. praticola*: 1·25 gm. potassium dihydrogen phosphate, 2·36 gm. calcium nitrate, 0·59 gm. magnesium sulphate, 6·25 gm. each of maltose and malt extract, 20 gm. agar, and distilled water to make 1,000 c.c., autoclaved at 10 lb. for 15 minutes. The optimum temperature for the development of the fungus was found to be 19° to 21° C., with an atmospheric humidity content of 65 per cent. The optimum humidity for basidiospore formation was about 60 per cent. and this process was markedly stimulated by light (daylight supplemented by a 500-Watt electric light), while sclerotia were produced only in the dark. The hydrogen-ion concentration of the medium (within the range of P_H 4 to 6·6) failed to influence either the growth of mycelium or the formation of basidiospores.

A comparative study [the results of which are fully described and discussed in considerable detail] was made of the spore-forming *Rhizoctonia* and three sterile cultures, viz., the above-mentioned R-43 and two apparently similar stock cultures designated R-22 and R-44. The perfect stage developed from numerous monospore isolations of the lucerne fungus, indicating its homothallic nature. The sterility of the non-spore forming cultures was found to persist irrespective of modifications in the external conditions, and the lack of fertility is therefore attributed to internal disturbances in the mycelium.

MARTIN (G. H.). **Certain early developmental phases common to many fungi.**—*Phytopath.*, xix, 12, pp. 1117–1123, 2 pl., 1929.

A brief discussion is given of certain budding phases which the author regards as common to many fungi and which he has frequently obtained in isolation from necrosed spots on plants. These are grouped into *Pseudosaccharomyces* and *Pseudofumago* forms [*R.A.M.*, viii, p. 175], the former characterized by spherical, oblong to elliptical, hyaline to brown, greenish-black or black conidia borne in a whorl or produced at the apex of a terminal cell or on a protuberance arising from any of the cells along the course of the fungous mycelium; and the latter by hyaline, brown, greenish-brown or black, septate hyphae producing papillae on which the budding spores are formed by sprout cells. Pure cultures made from single spores or segments of the *Pseudosaccharomyces* and *Pseudofumago* phases from various hosts [which are enumerated] developed fruiting bodies of the following form genera in the author's experiments: *Ascochyta, Cladosporium-Hormodendron, Colletotrichum, Coniothyrium, Fusicladium, Gloeosporium, Kabatiella, Marssonina, Microstroma, Phoma, Phyllosticta, Sclerotium, Glomerella,* and *Pleosphaerulina.*

DEARNESS (J.). **New and noteworthy fungi. VI. Hyphomycetes.**—*Mycologia,* xxi, 6, pp. 326–332, 1929.

In his sixth list of new and interesting fungi collected in North America [*R.A.M.*, viii, p. 66] the author gives English diagnoses of

24 Hyphomycetes. The following (all new species) are of phytopathological interest. *Coniosporium parasiticum* was found apparently parasitizing green cotyledons of *Citrullus vulgaris* in Ontario, although it has not been proved that it is not a secondary organism. *Cladosporium subsessile* is stated to be very common on leaves of the aspen (*Populus tremuloides*) along the river banks in the vicinity of Saskatoon, Saskatchewan; it forms numerous, circular spots, 2 to 3 mm. in diameter. *Stigmina vitis* Dearn. & Barth. forms on the leaves of *Vitis girdiana* in California amphigenous, dull greyish brown to dark brown spots, 3 to 10 mm. in diameter. *Cercospora phaseoli* forms, on living leaves of French beans in Missouri, numerous, scattered, subcircular, immarginate spots, 0·5 to 1 mm. in diameter, dull reddish brown above and sooty grey below. *Stigmella platani-racemosae* Dearn. & Barth. forms on the leaves of *Platanus racemosa* in California small, scattered, sooty, hypophyllous blotches which extend indefinitely; the upper side over the affected areas later becomes brown. *Exosporium betheli* was found on living branchlets of *Juniperus occidentalis* in California, on which it produced black lines between the leaf scales, bearing minute, contiguous, seriate sporodochia. Bethel, who made several collections of this species, stated that he always found it associated with *Gymnosporangium inconspicuum*, apparently developing on the mycelium or incipient stage of the rust.

T[UNSTALL] (A. C.). **Prevention of disease in young nurseries.** —*Quart. Journ. Indian Tea Assoc., 1929,* 4, pp. 157–158, 1929.

Directions are given in popular terms for the prevention of disease in tea nurseries by sanitary precautions in the preparation of the site. These should include a heavy dressing of cattle manure to be given at least a month before sowing the seed; throwing up the surface of the beds into ridges about six inches in height and width, followed by covering the entire site with six inches of thatch straw or other inflammable material to be burnt about a week before sowing; adequate shading of the beds with thatch high enough for a child to walk underneath. The seed should be mixed with a large quantity of damp powdered charcoal or coarse sand from a river bed, and stored in a cool place to prevent loss of moisture, if it cannot be planted soon after receipt.

JACZEWSKI (A. A.). Кольцевая пятнистость Табачных листьев. [Ring spot of Tobacco leaves.]—*Ann. Inst. of Exper. Agron.*, Leningrad, vi, 5–6, pp. 61–65, 2 figs., [? 1928. Received March, 1930.]

The author states that tobacco leaves sent to him from the government of Tchernigoff [South Russia] in 1928 showed a condition morphologically indistinguishable from the ring spot described by Wingard and his collaborators from America [*R.A.M.*, viii, p. 139]. Attempts to obtain a parasitic organism from the diseased leaves failed, and it is concluded that this is a genuine case of ring spot and is the first record of the disease in Europe,

though a very similar, if not identical, spotting of tobacco was reported in 1927 from Soukhoum [Black Sea littoral: cf. ibid., ix, p. 227]. Stress is laid on the necessity of following very closely the further spread and behaviour of the trouble, as it is impossible to foresee how it will develop in its new habitat and the possibilities of its being highly injurous to the crop are considerable. The only control measure which may be recommended for the present is a drastic and early eradication of all infected plants as they appear in the fields.

DORAN (W. L.). **Effects of soil temperature and reaction on growth of Tobacco infected and uninfected with black root rot.**—*Journ. Agric. Res.*, xxxix, 11, pp. 853–872, 2 figs., 3 graphs, 1929.

Continuing his studies of the black root rot disease (*Thielavia basicola*) of tobacco [*R.A.M.*, vii, p. 280], the author gives details of experiments and field observations at Amherst, Massachusetts, in 1927 and 1928, to determine the joint effect of variations in soil temperature and reaction on the development of the disease. In pot experiments with infected soil at constant temperatures, no or very little black root rot developed at any of the temperatures tested in soils with a P_H value of 5·6 or lower. Appreciable injury began to appear at the following critical reaction and temperature points: P_H 5·7 at 15° C., 5·7 or 5·8 at 18°, 5·8 at 21° and 24°, and 5·8 or 5·9 at 27°. Above 27° black rot did little or no damage even in soil with P_H values of 6.0 to 6·9. In less acid soils (P_H 5·9 to 6·5) young tobacco seedlings appeared to be more susceptible than older plants to the inhibiting action of *T. basicola* on their growth, nor were they as effectively protected by higher soil temperatures. Under optimum conditions the incubation period for seedling infection was two to three weeks, the colder the soil (down to 18°) and the closer to neutral its reaction, the shorter being this period. In field observations on soils with a P_H value of about 6·0, black root rot in 1927 and 1928 was sufficiently severe to reduce the yield of tobacco by 40 per cent., as compared with the yield in the more acid soil of adjoining plots.

In experiments made to test the effect of liming on soils infected with, and free from, *T. basicola*, it was shown that on heavily infected soil a strain of Havana tobacco susceptible to black root rot produced 37 per cent. less than on unlimed soil, while the yield of a resistant strain was not significantly affected by the lime; this is believed to indicate that it is the fungus and not the lime that is the direct cause of the poor growth of tobacco. In the absence of the fungus, applications of lime not only did not interfere with the growth of the plants, but sometimes increased it, though applications which benefited tobacco at higher soil temperatures (27° and 30° C.) resulted in a retardation of growth at temperatures below 24°. At low soil temperatures the application of lime in a glass-covered seed bed was shown to be seriously injurious to the growth of the seedlings, even in soil in which black root rot infection had been reduced to a trace by earlier formaldehyde treatment of the soil. This harmful effect was greater in soil disinfected with formaldehyde than in soil not so treated.

Kuyper (J.) & Jochems (S. C. J.). **Mimosa invisa, hare rol in de Deli-Tabakscultuur en hare biologie.** [*Mimosa invisa*, its rôle in Deli Tobacco cultivation and its biology.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, lxiii, 140 pp., 4 pl., 4 diags., 3 graphs, 1929. [English summary.]

This comprehensive account of the biology of *Mimosa invisa* and its rôle in the cultivation of tobacco in Deli, Sumatra, contains an extensive section, accompanied by graphs and numerous tables, on the effects of this crop in the prevention of slime disease [*Bacterium solanacearum*: *R.A.M.*, vi, p. 759]. Extensive well authenticated observations [details of which are given], covering a period of eight years, have demonstrated the beneficial action of *M. invisa* on the incidence of slime disease, which may be reduced, in counts made two months after planting, from 50 or more to about 5 per cent. where *Mimosa* has been grown for upwards of six years.

Höstermann (G.) & Merkel (L.). **Zweckmässige Bekämpfung der Braunfleckenkrankheit in Tomaten-Kulturen unter Glas.** [Systematic control of the leaf mould disease in Tomato cultures under glass.]—*Nachricht. über Schädlingsbekämpf.*, iv, 4, pp. 143–146, 1929.

Directions are given in popular terms for the control of tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, viii, p. 534], which is stated to cause heavy damage in German glasshouses. All diseased material should be collected and burnt and the framework, walls, soil, etc., of the houses sprayed with a 0·25 per cent. solution of uspulun, while the walls should also be painted with milk of lime to which solbar is added at the rate of 300 gm. per 10 l. The sticks or strings on which the plants are trained should also be disinfected with 3 per cent. solbar. The seed for the next crop should be treated, as a precautionary measure, with a standard fungicide, though there is no reason to suppose that the disease is generally carried in this manner. The young plants should be sprayed with 0·75 per cent. solbar, which at a later stage may be applied at the rate of 200 to 250 l. of solution per 600 sq. m. of ground surface. Watering should be done in such a way that the surface of the soil dries rapidly, e.g. in furrows or by means of subterranean drain pipes [see above, p. 276]. The temperature of the houses should be maintained at 18° to 25° C.

Day (W. R.). **Environment and disease. A discussion on the parasitism of Armillaria mellea Vahl. Fr.**—*Forestry*, iii, 2, pp. 94–103, 1929.

After a brief reference to the relationship which exists between environmental conditions and disease of forest trees considered as a whole, the author gives a concise review of the literature on the pathogenicity of *Armillaria mellea* [the more recent of which has been noticed in this *Review*], with particular reference to conifers in Europe. This study, in conjunction with his own experience, leads him to consider that, although a proved parasite, the fungus can only establish itself successfully on a tree, and kill it, when other, less obvious causes, such as drought, defoliation, or human

interference with natural conditions, have brought about a weakening of the host and thus lessened its resistance. Although very complex, the question of the origin of susceptibility of forest trees to root rotting fungi, such as *A. mellea*, may be solved by a better knowledge of the reaction of the trees to their environment, especially necessary at the present time when new species are constantly being introduced outside the range of their natural distribution. This problem is not a pure mycological or entomological matter, but needs the active co-operation of plant pathologists and silviculturists.

BETREM (J. G.). **De Iepenziekte en de Iepenspintkevers.** [The Elm disease and the Elm sap beetles.]—*Tijdschr. over Plantenziekten*, xxxv, 11, pp. 273–288, 3 pl., 1929. [German summary.]

An account is given of the writer's preliminary studies on the biology of the large elm sap beetle (*Scolytus scolytus*), which is suspected of being concerned in the transmission of *Graphium ulmi*, the causal organism of the elm disease [*R.A.M.*, vii, p. 684; viii, p. 704; ix, p. 4].

The life-history of the elm beetle has never been fully worked out. There are two generations each year (May to June and August to September in Holland). Reproduction is preceded by a week's feeding on the bark, sapwood, and probably also the buds of the topmost branches of both healthy and diseased or enfeebled trees. After the week's feeding the females bore galleries in the bark of diseased or weakened trees.

Experiments, conducted in collaboration with J. J. Fransen and Miss Spierenburg, showed that the beetles, when shaken in sterile water or allowed to crawl on sterile agar plates, produced numerous colonies of *G. ulmi*. The intestines of these beetles, after external disinfection with concentrated corrosive sublimate solution, yielded almost exclusively colonies of *G. ulmi* on agar plates. It is thus evident that *S. scolytus* can act as a vector of *G. ulmi*, transmission presumably taking place through the wounds inflicted by the insect in the process of feeding. The beetles which bore galleries in the diseased elms also assist in the spread of infection.

A study of the Dutch meteorological records from 1917 to 1929, inclusive, shows that the elm disease is most prevalent during or immediately after dry periods, when the insects have ready access to the sapwood. In rainy weather the old galleries are full of water which impedes their progress. *S. scolytus* is also particularly apt to attack newly transplanted trees. Hence it is necessary to water elms during abnormally dry weather and after transplanting, in order to prevent the attacks of the sap beetle and subsequent infection by *G. ulmi*. An important control measure consists in the felling and decortication of all elms infested by *S. scolytus*, the latter process being essential to prevent the development of the insects as well as of the fungus, which fructifies on the inner side of the bark, and also on the outer under humid conditions. These operations should be carried out at the end of July or beginning of August, and again during the winter. The attention of beetles may be diverted from the elms by the use of

so-called 'catch' trees, destined for felling for various reasons. The roots of these trees are wounded or the base of the trunk decorticated in order to facilitate ingress, after which the trees are cut down and decorticated.

[This paper also appears as *Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 60, pp. 3–17, 3 pl., 1929.]

Spierenburg (Dina). **Eenige oude gegevens over ziekten in boomen (voornamelijk in Iepen).** [Some old references to tree diseases (especially in Elms).]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 60, pp. 18–38, 1929.

Some references are cited from old journals (dating from the early part of the nineteenth century) to obscure pathological conditions of elms and other trees in the Netherlands, England, and France. The disturbances were generally attributed to the effects of gas or to insect depredations. In a book entitled 'La Physique des Arbres' (1785) by Duhamel du Monceau, an elm disease is described which bears some resemblance to that occurring in Holland and elsewhere [caused by *Graphium ulmi*: see preceding abstract]. The French elms, apparently in the best of health, died quite suddenly, with the yellow, desiccated leaves still adhering to the trees. The bark was detached from the wood and the intervening space was filled with a reddish liquid. Elm varieties with small leaves were found to be less susceptible to this disease than the rapidly-growing large-leaved varieties.

The author concludes that obscure elm diseases are by no means new, but whether these conditions were identical with that now affecting elms in various European countries cannot be stated with certainty.

Nisikado (Y.) & Matsumoto (H.). **A new disease of Elm, caused by Gnomonia oharana n. sp.**—*Ber. Ōhara Inst. Landwirtsch. Forsch.*, iv, 2, pp. 279–287, 3 pl., 1929.

In November, 1917, a black spot of elm (*Ulmus parvifolia*) was observed for the first time in Japan and was then attributed to the fungus causing a similar disease in America, namely, *Gnomonia ulmea* [*R.A.M.*, vi, p. 215]. Since that time the disease has been observed every year on *U. parvifolia*, *U. japonica*, *U. pumila*, and *U. laciniata* [ibid., ix, p. 71]. The imperfect stage of the causal organism is referred to *Placosphaeria ulmi* P. Henn. = *Asteroma ulmi* (Klotzsch) Cke, and the perfect to *Gnomonia* as *G. oharana* n. sp.

The first symptom of the disease, which breaks out after the opening of the new leaves in the spring and persists until late autumn, is the development of small yellowish spots (up to ten on a single leaf) which gradually enlarge to about 10 mm. in diameter. Black stromata, measuring 0·5 to 1 mm., are produced in the centre of the spots, and below them the perithecia develop. These are spherical, depressed-spherical, or elongated, 180 to 380 μ (average 251 μ) in breadth and 120 to 280 μ (average 188 μ) in height; they are provided with cylindrical, elliptical, or obovate beaks, 20 to 180 μ (average 90 μ) in diameter and 20 to 200 μ (average 105 μ) long. The hyaline, clavate, straight or slightly curved asci,

measuring 40 to 60 μ (average 50·5 μ) in length and 10 to 20 μ (average 13 μ) in width, are formed at the base of the perithecia and contain eight biseriate ascospores. The latter are hyaline, obovate, 10 to 16 μ (average 13 μ) in length and 3·6 to 6 μ (average 5·3 μ) in width, and unequally bicellular, the basal cell being much smaller (3 to 3·5 μ in length and width) than the apical. The hyaline, cylindrical conidiophores of the imperfect stage are produced in densely packed layers at the bottom of flat acervuli in the black stromata; at their apex they bear long-elliptical or fusiform, non-septate conidia, measuring 3·2 to 6 μ (average 4·2 μ) in length and 1·6 to 2·4 μ (average 2 μ) in width.

An English diagnosis of the fungus is given.

Barss (H. P.). **Recent notes on Chestnut blight in Oregon.**—*Plant Disease Reporter*, xiii, 14, pp. 173–174, 1929.

In August, 1929, at Gunter, Oregon, a Paragon chestnut tree obtained from Pennsylvania about 1916 was found to be attacked by blight [*Endothia parasitica*: *R.A.M.*, viii, p. 535], which also affected an adjacent Spanish chestnut of approximately the same age. No other trees in the vicinity were attacked and the two diseased trees were felled and burnt. There are no known chestnut plantings within 20 miles of Gunter.

Legislative and administrative measures. Spain.—*Internat. Bull. of Plant Protect.*, iii, 12, p. 186, 1929.

An Order (No. 357) dated 13th September, 1929, prohibits the importation into the Spanish Territories in the Gulf of Guinea of suckers, roots, &c., intended for the propagation of bananas of any variety. Any other plants or parts thereof may be imported if accompanied by a duly authenticated certificate of freedom from pests and diseases. A further inspection of imported plants at the Agronomic Laboratory may be required; any material failing to satisfy the standards exacted by the authorities will be destroyed without compensation and a fine of 1,000 to 10,000 pesetas imposed on the consigner.

Destructive Insect and Pest Act, England. The Wart Disease of Potatoes (Amendment) Order of 1929.—2 pp., 1929.

The Wart Disease of Potatoes (Amendment) Order, dated 3rd December, 1929, and effective from 1st January, 1930, prohibits the planting, in allotments not exceeding one-quarter of an acre in extent or in private gardens within certain [specified] areas in and near the Holland division of Lincolnshire (including the boroughs of Wisbech and King's Lynn in the administrative counties of the Isle of Ely and Norfolk, respectively), of any potatoes which are not certified stocks of an approved variety immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, viii, p. 56]. The following five non-immune varieties, however, are excepted from this rule: Sharp's Express, Eclipse, Epicure, May Queen, and Duke of York, as also are potatoes of immune varieties saved from the crop grown on the same land in the previous year, and (before 30th June, 1930) any potatoes saved from the crop grown on the same land in 1929.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

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PETRI (L.). **Il grado di resistenza delle varietà selvatiche di Castanea vesca Gaertn. al mal dell' inchiostro.** [The degree of resistance of wild varieties of *Castanea vesca* Gaertn. to ink disease.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 3, pp. 291–292, 1929.

In December, 1928, the author planted some wild chestnuts (*Castanea vesca*) from Germany and a cultivated Italian variety, inoculating the collar of three plants of either sort the following June with *Phytophthora cambivora* [*R.A.M.*, viii, p. 474; ix, p. 72]. Twelve days later the inoculated cultivated chestnut seedlings showed a yellowing of the leaves and 18 days after inoculation were withered. Two of the German seedlings developed a yellowing of the leaves after 22 days and withering after 30 days, the third remaining unaffected. In the cambium and cortex of the Italian plants the mycelium and chlamydospores of *P. cambivora* were observed, but they were not present in the two infected German plants, where a more active formation of suberized cells took place, limiting the infection to the cortex.

It is concluded that wild chestnuts from localities where ink disease is not present are slightly more resistant to *P. cambivora* than are cultivated varieties, but not sufficiently so to be used as stocks.

HEDGCOCK (G. G.). **The large leaf spot of Chestnut and Oak associated with Monochaetia desmazierii.**—*Mycologia*, xxi, 6, pp. 324–325, 1929.

The author states that the observations conducted by him since 1912 show that the leaf spot of trees associated with *Monochaetia desmazierii* occurs in the United States from Indiana to New Jersey and southward to Arkansas and Florida, and has been recorded on eighteen species belonging to the genera *Acer*, *Castanea*, *Hamamelis*, *Hicoria*, *Quercus*, and *Ulmus*.

NELSON (R. M.) & BEAL (J. A.). **Experiments with bluestain fungi in southern Pines.**—*Phytopath.*, xix, 12, pp. 1101–1106, 1929.

The results [which are fully described] of inoculation experiments on *Pinus rigida* and *P. echinata* near Asheville, North

Carolina, with blue-staining fungi (*Ceratostomella* spp.) [*R.A.M.*, viii, p. 746] indicated that these organisms are capable of killing wounded pines within a comparatively short time. These fungi are considered to play a prominent part in the destruction of trees attacked by various boring beetles, which apparently convey the organisms into their tunnels and thus inoculate the trees. The death of southern pines attacked by these beetles is thought to be due in large part to the associated blue-staining fungi.

Tikhotzky (V. P.). Домовой гриб, его разрушительная деятельность и меры радикальной борьбы с нею. [The house fungus, its destructive activity, and means for its effective control.]—60 pp., 8 figs., Государств. Технич. Издат. [State Technical Publications Office], Moscow, 1929.

In the introductory part to this pamphlet the author states that in recent years the damage done by constructional wood rotting fungi, among which *Merulius lacrymans* is the most frequent and the most dangerous, has increased enormously all over Russia. In towns like Leningrad and Moscow surveys have shown that practically every house is infected, not excluding buildings of national importance, such as museums, former palaces, public schools, and the like. Of the contributory causes to this state of things mention is made of the lack of well-seasoned, sound timber for repairs and new construction, and of the overcrowding of inhabited buildings.

A detailed account is given of the conditions that predispose houses to dry rot, of the various types of destruction caused in different parts of the buildings, and of the morphology and biology of *M. lacrymans*. In a final chapter recommendations are made for the effective prevention and eradication of house fungi, and brief descriptions are given of a number of chemical fungicides now in use in Russia, together with instructions for their application.

Marchionatto (J. B.). **La presencia de la 'Plasmodiophora brassicae' en la República Argentina.** [The presence of *Plasmodiophora brassicae* in the Argentine Republic.]—*Physis (Rev. Soc. Argentina Cien. Nat.)*, ix, 34, pp. 455–456, 1929.

The presence of *Plasmodiophora brassicae* as a parasite on cabbage at Roosevelt (Buenos Aires) is recorded, details of the attack being reserved for publication in the volume commemorating the 25th anniversary of the Agricultural and Veterinary Faculty of Buenos Aires University.

Haenseler (C. M.). **Reduction in yield of Peas due to root rot caused by Aphanomyces euteiches.**—*Forty-ninth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1928*, pp. 273–275, 1928. [Received February, 1930.]

The results [which are tabulated and briefly discussed] of greenhouse and field observations on the effects of root rot (*Aphanomyces euteiches*) on Alaska peas [*R.A.M.*, viii, p. 622] showed that the disease causes a heavy reduction in the dry weight of the crop. In one case the decrease in seed and straw weight of inoculated

peas was 20·4 and 21·3 per cent., respectively, as compared with the controls. The height and general appearance of the plants are comparatively little affected.

GRAINGER (J.). **The appearance of Bean mosaic in England.**—*Proc. Leeds Phil. Soc.* (*Scient. Sect.*), ii, 1, p. 32, 1 pl., 1929.

Dwarf kidney beans [*Phaseolus vulgaris*] of the Monster Negro variety at Weetwood, Leeds, were observed, in November, 1929, to be suffering from a chlorotic mottling accompanied by symptoms identical with those of the mosaic disease as reported from America [*R.A.M.*, vii, p. 495]. Infected plants are markedly stunted, the leaflets being frequently recurved when young but appearing flatter at a more advanced stage. A well-defined, pale yellowish-green mottling is irregularly distributed over the leaf surface, the darker parts of which are often puckered upwards. Flowering and pod setting are apparently normal, but the yield of affected plants is necessarily reduced. Where the disease, as in the present case, occurs on a very small scale, it could probably be entirely eliminated by the use of selected seed. Infected plants in stocks intended for seed should be removed immediately on detection.

VERPLANCKE (G.). **Les maladies à virus filtrants de la Betterave.** [Beetroot diseases caused by filterable viruses.]—*La Sucrerie Belge*, xlix, 7, pp. 121–127, 1929.

After a brief historical account of curly top and mosaic of sugar beets, the writer discusses the present situation with regard to diseases of this type in Belgium. Plants showing symptoms resembling those of curly top have been observed at Gembloux. In some respects, however, the characteristics of the diseased Belgian plants differ from those reported from the United States. In some cases the transparent zones round the leaf veins are quite narrow and pursue a very tortuous course, while in others they are pale yellow, relatively broad, and follow the direction of the veins more closely. Sometimes small yellow depressions wind round the veins. These may be merely variants of the ordinary form of curly top, or they may represent a distinct disease. The juice of diseased fodder and sugar beets was inoculated into the leaves and wounded crowns of sugar beets with positive results, the incubation period being about three weeks. The insect vector of curly top in America, *Eutettix tenella* [*R.A.M.*, ix, p. 154], has not yet been found in Belgium.

Five types of mosaic have been observed at Gembloux, viz., (1) ordinary mosaic, characterized by pale yellow spots on a dark green ground, the radiating, later confluent lesions remaining localized between the veins; (2) more or less isolated, circular spots with dark green centres, the leaf edges very crinkly; (3) isolated radiating yellow spots, the points of the rays being much more delicate and longer than in (1); (4) necrotic spots on the leaf; (5) almost entirely yellow leaves, with the exception of some scattered green, very angular spots. Positive results were given by inoculation experiments on healthy beets with the juice of mosaic plants, the incubation period being 21 to 25 days. In some fields inspected by the writer the incidence of mosaic amounted to

between 74 and 85 per cent. Chemical analysis of some of the affected material (fodder beets) revealed a reduction of the sugar content from 7·2 to 6·7 per cent.

The so-called 'yellows' disease [ibid., ix, p. 152], which was found to cause a reduction in the sugar content from 17·77 to 17·22 per cent., was transmitted from infected to healthy plants in the same way as mosaic and curly top, the incubation period being 15 to 21 days.

LACKEY (C. F.). **Further studies of the modification of Sugar Beet curly top virus by its various hosts.**—Abs. in *Phytopath.*, xix, 12, pp. 1141–1142, 1929.

The curly top virus of sugar beets [*R.A.M.*, ix, p. 282] was attenuated by passage through *Chenopodium album* and *C. album viride*, tomato, *Nicotiana rustica*, squash (*Cucurbita maxima*), watermelon, spinach, and resistant sugar beet. Preliminary tests indicated that the attenuated virus may be reactivated almost to its original virulence by passage through the highly susceptible chickweed (*Stellaria media*).

CARSNER (E.) & LACKEY (C. F.). **Mass action in relation to infection with special reference to curly top of Sugar Beets.**—Abs. in *Phytopath.*, xix, 12, p. 1137, 1929.

The effect of mass action is stated to have been shown to occur in curly top of sugar beets [see preceding abstract] and is considered to explain the significance of the observed relationship between time of planting and extent of damage in beet fields. It confirms the view that the incidence of infection is positively correlated with the number of invading leafhoppers [*Eutettix tenella*: *R.A.M.*, viii, p. 695], and is useful as a rough measure of curly top resistance.

HOLMES SMITH (E.). **Autumn-sowing variety of Onion resistant to frost and white rot.**—*Gard. Chron.*, lxxxvi, 2240, pp. 429–430, 2 figs., 1929.

A satisfactory degree of resistance to white rot (*Sclerotium cepivorum*) [*R.A.M.*, viii, p. 629] has been shown by the White Welsh onion variety in Lancashire and Cheshire. This variety does not appear to be commonly cultivated in England, but it might well be more extensively grown as a substitute for the popular White Lisbon, which is highly susceptible to white rot and also more liable to frost injury than the White Welsh onion.

HIURA (M.). **Studies on some downy mildews of agricultural plants. III. On the downy mildew of Spinach.**—*Agric. & Hort.*, iv, 12, pp. 10–22, 1929. [Japanese, with English summary.]

The author's recent field observations, extending over a period of four years, have shown that near Gifu, Japan, downy mildew of spinach (*Peronospora*) [*effusa*: *R.A.M.*, viii, pp. 218, 626] usually makes its first appearance at the end of October, becomes prevalent in mid-November, declines in severity after the middle

of December, and repeats this cycle from the end of March till early May.

Experiments have shown that the conidiophores and conidia are produced between 5° and 20° C. on cut leaves kept under moist conditions for 10 to 15 hours. The optimum temperature for conidiophore and conidial production is near 10°, though fair numbers were also formed at 7° and 15°. The optimum temperature for conidial germination was found to range from 8° to 10°, with a minimum below 3° and a maximum about 30°. The time required for the process varies with the temperature, being 3 hours at 3°, 2 at 7°, 1 to 1½ at 10° and 15°, and 1½ to 2 at 25°. The mycelium was found to hibernate within the host tissues. Oospores with an average diameter of 30 μ are produced sparingly in early December and most abundantly in the following May, sometimes appearing by the middle of April.

Inoculation experiments showed that the *Peronospora* from spinach cannot infect the common pigweed [*Chenopodium rubrum*], while that from the latter host is unable to attack spinach. The fungi further possess morphological differences which are regarded as specific in rank.

KLEBAHN (H.). **Bekämpfung der Blattfleckenkrankheit und der Schorfkrankheit der Sellerieknollen durch Anzucht gesunder Selleriepflanzen.** [Control of leaf spot and of the scab disease of Celery rootstocks by the cultivation of healthy Celery plants.]—*Obst- und Gemüsebau*, lxxv, 12, pp. 232–234, 1 fig., 1929.

Popular notes are given on the symptoms and life-history of celery leaf spot (*Septoria apii*) [*R.A.M.*, viii, p. 10] and scab (*Phoma apiicola*) [ibid., viii, p. 285], both of which are stated to cause heavy losses in the Hamburg district of Germany. The control measures recommended include seed treatment (24 hours' immersion in copper sulphate, 20 gm. in 1 l. of water, followed by washing in water with or without lime), and disinfection of the seed-bed with formaldehyde (¼ l. of the 40 per cent. solution per sq. m.). The seedlings should be transplanted to an area which has borne neither celery nor parsley in the previous year.

THOMAS (H. E.) & MILLER (A. S.). **Some factors which influence the infection of Apium graveolens L. by Septoria apii Rostr.** —*Amer. Journ. of Botany*, xvi, 10, pp. 789–798, 1929.

An account is given of a series of experiments conducted at Cornell University to determine the relation of nutritional factors to the infection of celery (mostly of the Golden Self Blanching variety) in pot cultures in a poor clay-loam soil by *Septoria apii* [see preceding abstract].

The results of the tests [which are tabulated] showed that the incidence of infection is increased by applications of nitrogenous compounds (sodium nitrate, ammonium carbonate, and ammonium sulphate), but only under conditions in which nitrogen is a limiting factor in the growth processes of the plant; by moderate applications of hydrated lime to a relatively acid soil in advance of inoculation; by the addition of a complete nutrient solution to the

soil; and by the addition of monobasic potassium phosphate to a soil deficient in available phosphorus.

A decrease of infection followed excess applications of sodium nitrate; applications of dextrose, saccharose, and galactose (the two former at the rate of 50 c.c. of a 3 per cent. solution per plant and the latter at that of 25 c.c. of a 1 per cent. solution); an inadequate supply of water to the soil before, during, or even after the incubation period in a moist chamber; and wounding of the roots (as in repotting).

KENDRICK (J. B.). **The toxicity of some commercial dusts to conidia of Bremia lactucae.**—Abs. in *Phytopath.*, xix, 12, pp. 1143–1144, 1929.

The relative efficacy of some standard commercial dusts in preventing the germination of the conidia of *Bremia lactucae* [*R.A.M.*, viii, pp. 577, 803] from lettuce leaves was tested under laboratory conditions in 1927. Drops of conidial suspensions were placed on dusted slides in Petri dish moist chambers and kept at 4° to 25° C. for 12 to 18 hours. Little or no toxic effect was exerted by the five sulphur compounds, kolodust, koloform, dry-mix, supersulfodust, and powdered sulphur [cf. ibid., ii, p. 506; vii, p. 204, *et passim*], whereas the four copper-lime dusts, D-5, D-16, D-25, and copodust, completely inhibited germination.

SYDOW (H.). **Eine neue deutsche Ustilaginee, Ustilago cichorii n. sp.** [A new German Ustilagine, *Ustilago cichorii* n. sp.] —*Ann. Mycol.*, xxvii, 5–6, pp. 413–415, 2 figs., 1929.

Chicory (*Cichorium intybus*) on the island of Rügen was observed, in August, 1928, to be attacked by a hitherto apparently unknown disease. In July, 1929, the author visited the locality and found a serious disorganization of the receptacles and floral organs, all the inflorescences on diseased plants being uniformly affected. The type of infection suggests that the mycelium is perennial in the rootstock.

The dark brown to purple, powdery spore masses are at first concealed by the closed bracts. The spores are mostly spherical or subspherical, 10 to 15 μ in diameter, or very broadly ellipsoid to broadly oval, 13 to 18 by 10 to 14 μ, with a brownish-purple, reticulate wall, 0·75 to 1 μ thick, and they germinate directly by means of a four-celled promycelium on which elongated-oval or ellipsoid conidia arise laterally and terminally.

The fungus is undoubtedly allied to other European species of *Ustilago* occurring on Compositae, viz., *U. cardui*, *U. tragopogonis-pratensis*, and *U. scorzonerae*. It is probably a very rare species, confined to the coastal regions, and specialized on a single host. It is named *U. cichorii* n. sp., with a Latin diagnosis.

GREEN (D. E.). **Cercospora leaf spot on Cucumbers.**—*Gard. Chron.*, lxxxvi, 2241, p. 449, 2 figs. (1 on p. 448), 1929.

During 1929 several outbreaks of *Cercospora melonis* [*R.A.M.*, vii, pp. 6, 7] occurred on cucumbers and melons in England, where little trouble has been experienced from this disease since the introduction of the Butcher's Disease Resister variety about 1907.

The symptoms of the leaf spot are briefly described and directions given for its control by cultural measures, spraying with liver of sulphur [potassium polysulphide] in mild cases, and the destruction of all severely diseased material, supplemented by thorough disinfection of the greenhouses and soil sterilization, e. g., with formalin.

HAENSELER (C. M.). **Effect of soil reaction on Verticillium wilt of Eggplant.**—*Forty-ninth Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1928*, pp. 267–273, 1928. [Received February, 1930.]

The results of experiments [which are discussed and tabulated] showed that the best growth of the eggplant wilt fungus (*Verticillium* sp.) [*V. albo-atrum*: *R.A.M.*, viii, p. 23] on solid or liquid media was made at P_H 6 to 8. Slight retardation occurred at P_H 5 to 5·5, severe retardation at P_H 4·2 to 4·5, and little or no growth took place below P_H 4·0. In a greenhouse test heavy applications of sulphur prevented wilt infection in an artificially inoculated soil. The application of lime to an infested field soil in quantities sufficient to give a reduction of P_H 6·5 to 7 caused an annual increase in the severity of wilt over a period of four years, whereas the application of sulphur at the rate of 300 or 600 lb. per acre (giving a soil reaction of P_H 4·2 to 5) resulted in a gradual decline in the incidence of the disease. The effects of heavy green manuring were beneficial.

LEHMAN (S. G.) & WOODSIDE (J. W.). **Varietal resistance of Soybean to the bacterial pustule disease.**—*Journ. Agric. Res.*, xxxix, 10, pp. 795–805, 1929.

The bacterial pustule disease (*Bacterium phaseoli* var. *sojense*) of soybean [*R.A.M.*, viii, p. 429; ix, p. 228] is stated to be widespread over the whole of North Carolina, where it causes very appreciable losses. In view of the unsatisfactory results so far obtained by the control measures in practice, such as seed disinfection, crop rotation, and field sanitation, field observations were made in the years 1925 to 1927, inclusive, and greenhouse and field inoculations in 1928, for the purpose of determining whether any varieties or strains of soybean in use showed resistance to the disease.

Of the 56 varieties of soybean tested, Columbia [a brief botanical description of which is given] was found to possess the greatest resistance, since it was entirely free from the disease in the field and only developed symptoms under especially favourable conditions in the greenhouse; even then the lesions developed more slowly and were smaller and fewer than on other resistant varieties, and the customary yellow halo around the pustules was almost completely suppressed. A list is given of the varieties which showed the highest, intermediate, and lowest resistance to the particular strain of the organism used in the tests.

KENDRICK (J. B.). **Susceptibility of Cowpea varieties and selections to Fusarium wilt and root knot.**—Abs. in *Phytopath.*, xix, 12, p. 1145, 1929.

In 1927, 74 plant selections were made in a field of Blackeye

cowpeas in the San Joaquin Valley, California, where 90 per cent. of the crop had been killed by *Fusarium* wilt [*F. tracheiphilum*: *R.A.M.*, vi, p. 717] and root knot [*Heterodera radicicola*]. These selections and 32 varieties of cowpea were planted in the same field in 1928. Thirty-two of the selections proved thoroughly susceptible, while the remaining 42 showed 55 to 95 per cent. susceptibility. The Brabham, Catjang, Columbia, Conch, Early Black, Iron, and Virginia Blackeye varieties were apparently immune; Taylor, Dixie Queen Browneye, Progressive White, Victor, Cream Crowder, and Large Black Eye 2 to 15 per cent. susceptible; Extra Early Blackeye, Potomac, Groit, and Gallavant 30 to 50 per cent.; Whippoorwill, Arlington, Ramshorn Blackeye, Early Buff, Wood's No. 11 Blackeye, Early Red, New Era, and White Queen 60 to 100 per cent.

Ravaz (L.). **Chronique: Sur le court-noué. Retour aggressif du pourridié.** [Current events: on court noué. Aggressive return of foot-rot.]—*Prog. Agric. et Vitic.*, xcii, 50, pp. 557–561, 1 col. pl., 1929.

A coloured plate is given showing a branch of a Rupestris vine affected by court noué [*R.A.M.*, vii, p. 763; ix, p. 83]; the basal leaves, formed in early spring, are dwarfed and markedly indented, this symptom being one of the salient features of the disease on Rupestris. On Taylor vines affected leaves are abnormally rounded, while on Aramon the leaf, though not much indented, is dwarfed or even spatulate. The leaves appear to become more normal the farther removed they are from the base of the branch. This applies to the whole vine, and any failure of the late growth to manifest such improvement indicates a serious attack of the disease. When improvement does occur, it may be due to a rise in temperature, a reduction of excessive soil moisture, or possibly to some improvement in the condition of the root system taking place between spring and autumn. In spring the rootlets of the previous year become blackened and perhaps products toxic to the vine may be liberated; as exterior conditions improve with the coming of summer, healthy new rootlets are formed. During autumn the root system is to a great extent healthy, but it again becomes diseased during winter. Court noué reappears in the following spring on the shoots at the tips of the branches which appear to have recovered, but is less severe than in the shoots at the base. Grafts taken from the tips give healthier scions than do those taken from the base. If the eyes at the extremity of the branch are allowed to develop and then, after pruning, the lower eyes are also allowed to grow, the latter develop almost normally. There is, apparently, a tendency for toxic matter to accumulate during winter in the tips of the pruned shoots, which causes the first growth to become affected but is absorbed by it, with the result that the second growth is more or less normal.

Most cases of root rot of the vine [generally attributed to *Armillaria mellea* or *Rosellinia necatrix*: *R.A.M.*, iv, p. 525], which is stated to be increasingly prevalent in France, are favoured by winter frosts and are characterized by a reddening of the foliage in autumn or by reduced vigour of the vine with the death of one

or more branches; in the spring the vines may brown badly or not at all. The likelihood of this can be foretold in the spring from the presence of a broad, blackish lesion on the graft near the union, or from tumours, which in 1929 were present on all the vines observed by the author to show a chocolate-coloured bark. The author recommends that affected vines, together with neighbouring, apparently healthy ones, should be completely uprooted and destroyed, the soil then being disinfected with carbon disulphide at the rate of 100 gm. per sq. m., another application being made three weeks before planting. The cost of the treatment is estimated at 4,000 to 5,000 francs per hect. [about £13 to £16 per acre].

Department of Botany. Biennial Report for the fiscal years ending Nov. 30, 1927 and 1928.—*Massachusetts Agric. Exper. Stat. Bull.* 247, pp. 306–313, 1929. [Received March, 1930.]

In the section of this report (by W. L. Doran) dealing with brown root rot of tobacco [*R.A.M.*, viii, p. 471] it is stated that when timothy [*Phleum pratense*] infusions were applied to soil in which tobacco plants were growing, the effect was harmless or very injurious according to the age of the infusions, i.e., to the stage of decomposition of the timothy. The response of the plants to an infusion of a given age was affected by the proportion of tops to roots in the timothy or by the temperature at which decomposition took place. The infusions which retarded the growth of the tobacco plants produced on the roots brown discolorations and lesions, apparently of the same type as those which in the field have given rise to the term brown root rot. These results support the view that the condition is the expression of the injurious effects on tobacco roots of some toxin or toxins which are formed from, and at certain stages in, the decomposition of vegetable organic matter, more especially the residues of some slowly decomposing crops such as timothy.

Chemical analyses of timothy infusions prepared weekly showed that the oldest infusions, which in previous experiments were less toxic to tobacco, contained the least ammoniacal nitrogen; but the age at which the content of ammoniacal nitrogen was greatest did not exactly coincide with the age at which infusions similarly made were most toxic to tobacco.

Soil treatment with formaldehyde or acetic acid reduced the amount of brown root rot subsequently present, but sulphuric and nitric acids in amounts sufficient to reduce the P_H value by 0·2 to 0·3 had no such effect. In field experiments on land previously planted to timothy which had been preceded by maize, the yield of cured tobacco leaf per acre was 16 per cent. greater in the plot treated with acetic acid than in the untreated control plot; orthophosphoric acid gave 17 per cent. increase.

In pot experiments thorough washing or leaching of the soil was followed by some reduction in brown root rot, but when the percolated water was used to water tobacco grown in steamed soil, it did not induce the disease. The disease was severe on plots where tobacco followed lucerne, timothy, and alsike clover [*Trifolium*

hybridum], the intensity being approximately the same on limed and unlimed plots.

Field experiments (by W. L. Doran) with sulphur and copper-lime dusts for the control of downy mildew of cucumbers (*Pseudoperonospora cubensis*) were conducted in 1927. When 10 applications of copper-lime dust were given, beginning before the disease appeared, the treated plots showed an increased yield as compared with the untreated controls of 97 per cent.; with 7 applications, beginning with the first appearance of the disease, the increased yield amounted to 54 per cent. Sulphur not only failed to control the disease but injured the foliage. In laboratory experiments sulphur was inferior to copper fungicides in preventing infection, but was more effective than copper in preventing sporulation when applied to leaves after inoculation or during the incubation period. The manner in which *P. cubensis* overwinters is unknown. Cucumber leaves killed by the mildew showed no sign of oospore formation; in 1927 and 1928 bodies resembling oospores appeared in the decayed tissues of infected cucumber plants buried in the soil throughout the winter, but all attempts to germinate these bodies or to obtain infection from inoculations with them were unsuccessful.

It was found that the youngest leaves of cucumbers are not susceptible to *P. cubensis*, apparently because they are not easily wetted and their stomata are closed. Dew serves as well as rain for sporulation, germination of the conidia, and infection; but rain is the most important factor in the rapid dissemination of the fungus. In the greenhouse the spread of *P. cubensis* was completely arrested by promptly removing infected leaves and maintaining a low humidity.

Tests with two commercial varieties of lettuce, Belmont and May King, showed that the former was very susceptible and the latter very resistant to downy mildew (*Bremia lactucae*).

An investigation (by E. F. Guba) of carnation blight (*Alternaria dianthi*) showed that this disease is favoured by the frequent syringing with water practised for red spider control in the greenhouse. Successful control resulted from using vaporized naphthalene against the red spider and care in the selection of disease-free plants to bring into the houses. A study of the effect of different fungicides on germinating spores of *A. dianthi* at 50° and 90° F. showed that sulphur dust was not toxic, but copper dust was toxic when moisture was present; Bordeaux mixture 2–2–50 or 4–4–50 was also toxic. As a spreader, fish oil or linseed oil at the rate of 0·3 per cent. of the diluted spray proved very effective.

No variety of eggplant was found to be resistant to wilt (*Verticillium albo-atrum*), though all the really distinct varieties are believed to have been tested. Since infection rarely occurs at a temperature above about 77° F., control of the disease by mulching the plants with paper appears to be possible.

Investigations (by W. H. Davis) into fungous diseases of grasses showed that *Sclerotium rhizodes* kills the leaves of grasses throughout the New England States, appearing in April and disappearing in the following month; it reduces the yield of hay in meadows by 30 per cent., and prevents the plants from maturing seeds.

Apparently, two distinctly different diseases present on lawns and golf greens are known as 'brown patch' [ibid., viii, p. 138]. From five out of seven cases of one of them, 'little brown patch', a species of *Fusarium* was isolated which killed redtop [*Agrostis palustris*] seedlings grown in sterilized compost soil into which the fungus was introduced. From 'large brown patch' *Rhizoctonia* [*Corticium*] *solani* was isolated, inoculations with which were successful on various grasses when the atmospheric conditions were warm and damp. Control was effected by mercury compounds. 'Snow mould' on lawns, golf greens, and fields was caused by a *Fusarium*. In 1927 it appeared in February and lasted until June, but did not cause serious damage.

A leaf spot of Chinese cabbage [*Brassica pekinensis*] has been under observation (by W. H. Davis) each autumn since 1923. Inoculations established the physiological identity of the causal organism with *Alternaria brassicae*, though its spores measured 7 to 103 by 5 to 29 μ as against 35 to 120 by 10 to 30 μ given in the descriptions of the latter.

BURKHOLDER (W. H.). **The genus Phytomonas.**—*Phytopath.*, xx, 1, pp. 1–23, 1930.

Taking as an example the genus *Phytomonas*, the author discusses the reasons for the existing confusion in the taxonomy of the bacterial plant pathogens, and suggests that contemporary workers are mistaken in considering this subject in the light of old-fashioned systems of classification instead of examining the group as a whole. The present study has demonstrated the existence of certain natural groups within this genus [the biochemical characters of which are shown in tabular form], and indicates the probable discovery of others as a result of closer investigation. Few characters are common to the genus *Phytomonas* as a whole, and if it were not that all are plant pathogens, they would fall into several different genera of Bergey's classification [*R.A.M.*, iii, p. 18]. It appears doubtful, however, whether single characteristics, such as the presence or absence of flagella, are adequate criteria for the separation of such groups, and further work is required before the rank to be assigned to them can be determined.

BRONFENBRENNER (J.). **Studies on the nature of bacteriophage.** —*Journ. of Bact.*, xix, 1, pp. 19–20, 1930.

In this paper (read at the thirty-first annual meeting of the Society of American Bacteriologists, held at Ames, Iowa, from 30th December, 1929, to 1st January, 1930) it was stated that a systematic study of the properties of the bacteriophage failed to reveal its living nature [*R.A.M.*, vii, pp. 455, 456]. The bulk of evidence seems to indicate that the bacteriophage is an inanimate chemical product of bacterial metabolism, possessing no lytic properties of its own. It seems to exert a stimulating effect on homologous or closely related species to that by which it is produced, as a result of which the rate of intracellular metabolism is abnormally increased, with a consequent rise in osmotic pressure within the cell. If water is available in the surrounding medium, the bacteria absorb it, swell, and finally burst. If, however, the water in the

medium is immobilized by the addition of hydrophilic colloids, the swelling and bursting of the bacteria is prevented; under such conditions visible lysis is replaced by a rapid multiplication of the bacteria when bacteriophage is added. The active principle (bacteriophage) is present in the medium in the form of discrete units of very variable dimensions. When purified, bacteriophage-containing solutions fail to respond to the most sensitive tests for protein, even when concentrated to 1/1,000 of the original volume. If concentration is carried on to dryness, it can no longer be brought into solution and its lytic activity is lost. Chemical analysis of the residue thus secured indicates that it may be a carbohydrate containing a small amount of nitrogen either in its molecule or as an impurity.

Hocquette (M.). **Nouvelles observations sur le 'black chaff' (été 1929).** [New observations on 'black chaff' (summer 1929).]—*Comptes rendus Soc. de Biol.*, ciii, 4, pp. 239–240, 1930.

Further observations made during 1929 in connexion with the black chaff disease [*Bacterium translucens* var. *undulosum*] of wheat in the Nord department of France [*R.A.M.*, viii, p. 359] showed that the infection, formerly restricted in extent and mild in character, is tending to spread and become more intense. Among the varieties attacked with greater or less severity may be mentioned Bon Fermier, Institut agronomique, Blanc précoce, Précoce C.D., Péréal Poti, Devazione 38, Coch el Bach, and the hybrids Yeoman × Institut agronomique, Paix × Rieti, and Bordeaux × Précoce C.D. Susceptibility to black chaff appears to vary in the different lines of a single variety or hybrid. Furthermore, a hybrid resulting from a cross between two immune parents may be susceptible, while the progeny of a susceptible and a resistant parent may be more susceptible than the former. So far the most virulent form of the disease, characterized by a bacterial exudate, has not been observed in France.

Goulden (C. H.). **Breeding rust resistant varieties of Wheat. Fundamental aspects of the problem.**—*Scient. Agric.*, x, 4, pp. 258–267, 2 figs., 1929.

This is a brief review of the work so far done in the investigation of the fundamental principles involved in the inheritance of rust [*Puccinia* spp.] resistance in crosses between susceptible and resistant varieties of wheat, followed by a discussion of the bearing of the results on the practical problem of breeding wheat varieties for resistance to rust. It is pointed out that the inheritance of mature plant resistance (which is exhibited by certain rust resistant varieties and which appears to apply equally to all of the known physiological forms of rust) is entirely independent of seedling resistance, and is very simple in nature, thus offering much greater possibilities in the production of resistant varieties than the building up of seedling resistance by a complicated series of crosses.

The bibliography appended comprises 34 titles.

Newton (Margaret), Johnson (T.), & Brown (A. N.). **Hybridization of physiologic forms of Puccinia graminis tritici.**—Abs. in *Phytopath.*, xx, 1, pp. 112–113, 1930.

Monosporidial pustules were obtained by inoculating individual barberry plants with sporidia from various physiological forms of *Puccinia graminis tritici* [*R.A.M.*, viii, p. 707] developed under controlled conditions. The nectar on the pustules derived from the same physiological form was intermixed ('selfing' individual forms), as was also that on pustules derived from two different forms ('crossing' two forms). Only one form appeared strictly homozygous for pathogenicity; when selfed, this form alone was recovered. The other forms were evidently heterozygous for pathogenicity, each giving rise on selfing to one or more different known or unknown physiological forms of the rust. Crosses between two forms also gave rise to known or unknown forms different from the parental ones. Some of the monosporidial pustules developing on barberry plants inoculated *en masse* with eight forms of the rust coalesced and produced aecidia. The nectar of the remaining ones was intermixed, and from the resulting pustules several of the original forms and a number of others, known and unknown, were recovered.

Stakman (E. C.), Levine (M. N.), & Cotter (R. U.). **Hybridization and mutation in Puccinia graminis.**—Abs. in *Phytopath.*, xx, 1, p. 113, 1930.

The results of experiments on hybridization in different varieties and physiological forms of *Puccinia graminis* on barberries, using the technique devised by Craigie [*R.A.M.*, viii, p. 296], confirmed the supposition that individual forms, even if selfed, might segregate if heterozygous [see preceding abstract]. Thus, from crosses between *P. graminis agrostis* and *P. g. tritici* form 36, several lines were obtained that differ pathogenically from both parents, and there is strong evidence that two of them have never been found in nature. Varieties and physiological forms of *P. graminis* are dikaryotic clones which remain constant in the uredo stage, except for mutation, but may lose their identity in passing through the barberry on account of segregation in the promycelia of the teleutospores or because of the initiation of a new dikaryophase in the pycnidia or aecidia. The suspected rôle of the barberry in the production of new forms is thus confirmed and the necessity for its eradication further emphasized.

Evidence of mutation in parasitism is also forthcoming. In a uredospore culture of *P. graminis tritici* form 1, which had been pathogenically constant for 13 years, an apparent mutant suddenly developed. Extensive inoculation experiments proved the constancy of the mutant, which differs in pathogenicity from any other form observed by the writers.

Cotter (R. U.). **Factors affecting the development of the aecidial stage of Puccinia graminis.**—Abs. in *Phytopath.*, xx, 1, p. 139, 1930.

Under suitable conditions the teleutospores of *Puccinia graminis* may remain viable for at least 1½ years. Spores kept wet

for 264 hours were still capable of causing infection, indicating that they do not necessarily germinate during the early spring rains before the unfolding of the barberry leaves. Temperatures of 12° to 21° C. were found to be the most favourable for infection and aecidial production. Infected barberries kept at 0° for three weeks developed pycnidia when the temperature was raised to 18° or 20°. Freezing killed infected barberries before the rust succumbed. The minimum incubation period for teleutospore infection was 21 hours. On *Berberis vulgaris* the leaves, stems, spines, petioles, sepals, and berries may be attacked. Leaves of *B. aetnensis* remained susceptible for 16 days after unfolding and those of *B. vulgaris* 12 days. Aecidiospores may be discharged as long as 37 days after aecidial formation and may cause infection 46 days after the appearance of the aecidia. More than one physiological form may be isolated from a single aecidial cup.

Wellensiek (S. J.). **Oriënteerend onderzoek omtrent physiologiese specialisatie van Puccinia triticina Eriks. in Nederland.** [Investigation to ascertain the position concerning the physiological specialization of *Puccinia triticina* Eriks. in the Netherlands.]—*Tijdschr. over Plantenziekten*, xxxvi, 1, pp. 1–12, 4 pl., 1930. [English summary.]

Among five isolations of brown rust of wheat (*Puccinia triticina*) from different parts of Holland (Groningen, North Holland, Zeeland, Limburg, and Wageningen), three physiological forms, viz., XI, XIV, and XV [*R.A.M.*, viii, p. 366], were found to occur. Of these, form XI is known in the United States and all three in Germany. The Groningen isolation was identical with form XI, the North Holland, Zeeland, and Limburg with form XIV, and the Wageningen with form XV. All the wheat varieties commonly grown in Holland, namely, Batauwe, Gelderse Ris, General von Stocken, Kruisingsangel, Mansholt III, Matador, Blé Noé, Robusta, Siegerländer, Svalöf's Ridder, Waard en Groet, W. × E.P., Zeeuwse wheat, Imperial IIa, and Jacob Cats proved more or less susceptible to all three forms of the rust. It should be possible, however, to develop resistant selections by crossing with such highly resistant foreign varieties as Malakoff and Norka.

Atanasoff (D.). Главнитѣ по житнитѣ растения въ България. I-во съобщение. [Cereal smuts in Bulgaria. First communication.]—*Annuaire Univ. de Sofia, Fac. Agron., 1928–1929*, vii, pp. 180–202, 1929. [English summary.]

In this, the first of a series of studies of cereal smuts in Bulgaria, the author gives details of a survey made from 1926 to 1928, inclusive, of the regional distribution of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetens*] on wheat. The latter species was found to be by far the most prevalent and to occur practically over the whole country. *T. caries* is restricted to two separate highland (foothill) areas, one in the extreme north-west of Bulgaria, between the Danube and the Jugo-Slavian frontier, and the other in the middle of the Danubian plain, where it has apparently found climatic conditions favourable for its development. Literature references and local observations would indicate that this species

was introduced into Bulgaria some twenty-five years ago with imported wheat, while *T. foetens* is of much older standing. There is evidence, however, that *T. caries* is slowly but steadily gaining ground, since traces of it have been found near Philippopolis in south Bulgaria, a fact which calls for active control measures, as the disease may prove very destructive in new areas.

Infection experiments on five pure lines of Bulgarian wheats and the two American varieties Hussar and Martin showed the existence in Bulgaria of at least four biological forms of *T. foetens* which differ in their reaction on differential hosts and in their geographical distribution. The most virulent form was that collected from Roustchouk in the north, and the least virulent that from Tchirpan in the south. Of the wheats tested Martin was the most resistant to all four forms (9·67 per cent. average infection), while the most susceptible was the Bulgarian pure line 84 (68·15 per cent. infection).

Demidova (Mme Z. A.). Опыты сравнительного протравливания зерна Пшеницы от мокрой головни. [Comparative experiments in the disinfection of Wheat seed grain for the control of bunt.]—Pamphlet issued by *Уралобластзара* [*Ural Regional Plant Protection Station*], Sverdlovsk, 21 pp., 1929.

After a brief reference to the considerable economic importance of wheat bunt [*Tilletia caries* and *T. foetens*] in the Ural region, the author gives a detailed account of experiments in 1927 and 1928 at the Ural Plant Protection Station [the results of which are presented in tabular form] to test the comparative value of formalin, copper and arsenic compounds, German proprietary preparations, and calcium and potassium bichromates for the disinfection of wheat seed grain. Formalin gave almost complete control, but affected adversely the germinability of the seed and the vegetative growth of the seedlings. Dehydrated copper sulphate gave good results with moderate contamination of the seed, but was less effective with heavily infected grain. Very good control was also afforded by germisan, but its high cost renders it prohibitive in the region. The tests with arsenic compounds were somewhat inconclusive, although potassium arsenate was very effective in 1927 and deserves further attention. A high degree of control was obtained by dusting the seed with calcium or potassium bichromate at the rate of 2 gm. per 2 kg. of seed. The efficacy of these last compounds was not apparently reduced by mixing them with inert powders, but it is pointed out that both bichromates are very toxic to man and animals, and that special precautions must be taken in handling them, such as the use of protective masks and clothing, smearing hands and face with fats, and the like. Locally both compounds are of very considerable interest, since big deposits of chrome ores exist in the Ural mountains and the compounds are prepared at very low cost at the local chemical works.

Brentzel (W. E.) & Smith (R. W.). **Varietal resistance of spring Wheats to bunt.**—*North Dakota Agric. Exper. Stat. Bull.* 231, 12 pp., 1 fig., 1 graph, 1929. [Received April, 1930.]

Twenty-eight varieties of spring wheat and three emmers were

tested for their reaction to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] at Fargo and Dickinson, North Dakota, from 1926 to 1928, inclusive. The durum wheats inoculated with *T. foetens* developed infection ranging from 11 per cent. in Kubanka (C. I. No. 2094), Nodak, and Mindum to 35 per cent. in Pentad. The hard red spring wheats inoculated with the same fungus developed infection ranging from a trace in Hope to 64 per cent. in Kota; the Ceres, Progress, and Haynes varieties were also very susceptible to this smut. The durums inoculated with *T. caries* developed infections ranging from 26 per cent. in Nodak to 51 per cent. in Monad and Pentad (50 per cent. in Kubanka). The Hope, Preston, Marquillo, Reliance, Marquis, Ruby, and Powers hard red varieties were highly resistant to *T. caries*, but Progress (69 per cent.), Kota, Ceres, Webster, and Haynes were susceptible.

Holton (C. S.). **Susceptibility of durum Wheats and Emmer to Tilletia tritici.**—Abs. in *Phytopath.*, xx, 1, p. 119, 1930.

The writer tabulates the results of inoculation experiments, conducted at St. Paul, Minnesota, with five collections of wheat bunt (*Tilletia tritici*) [*T. caries*] from Washington, California, Manitoba, North Dakota, and Minnesota. The first three collections are approximately equal in virulence on the varieties inoculated, but that from North Dakota is particularly severe on the durums (51 and 42 per cent. infection on Mindum and Pentad, respectively) and that from Minnesota on Vernal emmer (24 per cent.). The Hope variety proved immune from all forms of the fungus tested, Marquillo and Marquis were highly resistant (especially the former), Kota was very susceptible, and Preston intermediate. The recent increase in bunt on the supposedly resistant durum varieties is attributed to the development of hitherto undescribed forms of *T. caries*, of which at least three are represented in the above-mentioned collections [cf. *R.A.M.*, vii, p. 774].

Woodward (R. C.). **A home-made mixing machine for dressing Wheat with copper carbonate.**—Leaflet of the School of Rural Economy, Oxford, 4 pp., 1 diag., 1929.

Details are given of the construction and application of a simple apparatus for the treatment of wheat seed-grain with copper carbonate for the control of bunt (*Tilletia caries*) [*R.A.M.*, viii, p. 493]. The lid covering the small opening in the top of the box is held in place by an iron strap, and strips of wood are screwed over the joints of the box, thereby preventing the escape of any large amount of the dust, which is liable to cause respiratory disturbances in the operators. The machine is constructed to treat about 2 bushels of wheat at a time, the copper carbonate being used at the rate of 2 oz. per bushel.

Dickson (J. G.), Shands (R. G.), Hoppe (P. E.), Johann (Helen), & Mains (E. B.). **Progress report on Barley and Wheat scab.**—Abs. in *Phytopath.*, xx, 1, p. 131, 1930.

Wheat and barley scab [*Gibberella saubinetii*] again occurred in epidemic form in the United States during 1929 [*R.A.M.*, ix, p. 101]. Though infection was comparatively mild it extended

westward over a new area. The damage was most severe where the crops were sown on poorly prepared land, and the secondary spread and losses were materially increased by cutting infected fields before thorough ripening. Two lines of control are being developed, viz., crop rotation and autumn ploughing, especially for barley, and the breeding of scab-resistant strains.

Shands (R. G.), Hoppe (P. E.), & Mains (E. B.). **Report upon scab-resistant cereal varieties.**—Abs. in *Phytopath.*, xx, 1, pp. 132–133, 1930.

The Michigan Amber, Illinois No. 1, and Progress wheat varieties are stated to have become more firmly established in the winter wheat area during the past two seasons in consequence of their resistance to scab (*Gibberella*) [*saubinetii*: see preceding abstract]. The standard barley varieties appear to vary less than wheat in their reaction to scab.

Mundkur (B. B.) & Cochran (R. L.). **Some feeding tests with scabby Barley.**—Abs. in *Phytopath.*, xx, 1, p. 132, 1930.

During the autumn of 1928, hogs and poultry in Iowa were extensively poisoned by the consumption of barley contaminated by *Gibberella saubinetii* [*R.A.M.*, ix, pp. 30, 31, and next abstracts], the perithecia of which were present on the surface of 4 to 8 per cent. of the grain. Feeding experiments were carried out on hogs, chickens, and guinea-pigs, all of which rejected an exclusive barley diet, while the two first-named developed symptoms of nausea and lost weight.

Roche (B. H.), Bohstedt (G.), & Dickson (J. G.). **Feeding scab-infected Barley.**—Abs. in *Phytopath.*, xx, 1, p. 132, 1930.

It has been found that cattle, sheep, and poultry on Wisconsin farms may be fed on barley infected with scab [*Gibberella saubinetii*: see preceding and next abstracts] without adverse effects, whereas pigs, horses, and dogs, as well as man, cannot tolerate even low percentages of badly scabbed kernels. It is suggested that a considerable saving may be effected by the utilization of infected fodder for the ruminants and poultry, since it must otherwise be sold at a heavy discount.

Dickson (A. D.), Link (K. P.), Roche (B. H.), & Dickson (J. G.). **Report on the emetic substances in Gibberella-infected Barley.**—Abs. in *Phytopath.*, xx, 1, p. 132, 1930.

The water extract from barley severely infected by scab [*Gibberella saubinetii*: see preceding abstracts], finely ground and extracted for four to six hours, was found to produce acute vomiting in pigs, and became more active when freed from protein, polysaccharides, and nitrogenous substances precipitable with tannic acid. The active substances or materials appear to be associated with the fractions containing glucoside or basic nitrogen compounds.

Mackie (W. W.). **Sclerospora macrocarpa in Barley.**—*Phytopath.*, xx, 1, p. 107, 1930.

Coast barley in the San Joaquin Valley of California was found, in June, 1929, to be attacked by a fungus which was identified by W. H. Weston as *Sclerospora macrocarpa* [? *S. macrospora*]. The infected culms yielded spikes which produced no grain, while other culms from the same plant developed normal spikes and kernels, but weak, reduced culms. The awns of the infected spikes were swollen, distorted, and curled. The entire culm, including the nodes and internodes, was darkened as in the case of infection by stripe disease (*Helminthosporium gramineum*). The upper leaves were often lacerated by the destruction of the interveinal tissue. Abundant oospores were produced but no conidia. In 1921 this disease was found on wheat in the same area.

Mains (E. B.) & Dietz (S. M.). **Physiologic forms of Barley mildew, Erysiphe graminis hordei.**—Abs. in *Phytopath.*, xx, 1, p. 142, 1930.

Using the only species of barley susceptible to mildew (*Erysiphe graminis hordei*), viz., *Hordeum vulgare*, *H. intermedium*, *H. distichon*, and *H. deficiens*, the writers discovered a number of very resistant varieties, the use of which led to the classification of five distinct physiological forms of the mildew [*R.A.M.*, viii, p. 433]. Thus, Nepal C.I. 595 is resistant (infection type 1–2) to physiological form I and susceptible to the four others. Peruvian C.I. 935 is resistant (0–1) to physiological forms I, II, and IV and susceptible (4) to III and V. Black Hulless C.I. 666 is resistant (1–2) to physiological forms I and II and susceptible (3–4) to III, IV, and V. Goldfoil C.I. 928 is highly resistant (0) to physiological forms I, II, III, IV and susceptible (4) to V. A number of varieties were found to be resistant to all five of the physiological forms.

Dietz (S. M.) & Murphy (H. C.). **Inheritance of resistance to Erysiphe graminis hordei, p.f. IV.**—Abs. in *Phytopath.*, xx, 1, pp. 119–120, 1930.

Susceptibility to physiological form IV of barley mildew (*Erysiphe graminis hordei*) [see preceding abstract] was found, as a result of inoculation experiments under controlled conditions, to be dominant and due to a single pair of factors. The response of 93 pure lines of barley was determined and the following hybrids made: Chevalier C.I. 156 (susceptible) × Goldfoil C.I. 928 (resistant). Goldfoil C.I. 928 × Velvet (susceptible). Odessa C.I. 927 (susceptible) × Goldfoil C.I. 928. Triebsol (susceptible) × Goldfoil C.I. 928. Twenty-two F_1 plants produced 790 F_2 plants, of which 588 were susceptible and 202 resistant—a very slight deviation from the expected ratio. In the F_3 tests, 49 of the susceptible F_2 produced 414 susceptible and no resistant individuals, while 52 segregated into 436 susceptible and 152 resistant. Twenty-five resistant F_2 plants were homozygous for resistance and produced 261 resistant F_3 plants.

Reddy (C. S.) & Burnett (L. C.). **Control of Barley stripe (Helminthosporium gramineum).**—Abs. in *Phytopath.*, xx, 1, p. 119, 1930.

The results of experiments in the control of barley stripe (*Helminthosporium gramineum*) in Iowa in 1928 and 1929 showed that ceresan [*R.A.M.*, ix, p. 299] and a dust consisting of 6 parts sodium bicarbonate, 6 parts sodium bisulphite, 8 parts mercuric chloride, and 80 parts talc were effective for this purpose. Of the 18 varieties tested in 1929, Minsturdi was the most susceptible and Trebi one of the most resistant.

Murphy (H. C.). **Physiologic specialization in Puccinia coronata avenae.**—Abs. in *Phytopath.*, xx, 1, pp. 143–144, 1930.

Single-uredospore isolations were made from 45 collections of crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*] [*R.A.M.*, viii, p. 499, and next abstract], 32 of which were found on *Avena* and 13 on *Rhamnus*. Each of these cultures was grown on pure-line selections of 33 varieties and species of oats, eight of which acted as differential hosts. These showed that nine physiological forms were represented, which are termed forms I to IX [cf. ibid., vii, p. 315]. Their action on the differential hosts is shown in a table.

The aecidial collections on five different species of *Rhamnus* represented the following physiologic forms: all four collections from *R. cathartica* gave form III; all six from *R. lanceolata* gave form V; one each from *R. tinctoria*, *R. montana*, and *R. infectoria* gave forms VII, VIII, and IX, respectively. Forms III and V were of most frequent occurrence on *Rhamnus* and I, III, and V on *Avena*. Form V was the most widespread and virulent, sparing none of the varieties, pure-line selections, or species of oats tested. Form I predominated in the south-western States.

Dietz (S. M.) & Murphy (H. C.). **Inheritance of resistance to Puccinia coronata avenae, p.f. III.**—Abs. in *Phytopath.*, xx, 1, p. 120, 1930.

The response of the F_1, F_2, and F_3 generations to a single physiological form of crown rust of oats (*Puccinia coronata*) [*P. lolii*], namely, p.f. III [see preceding abstract], was determined under controlled greenhouse conditions. Resistance in the following crosses was dominant and due to two pairs of factors, one of which was an inhibitor for resistance: Sunrise 23—resistant (SSii) × Fulghum 41—susceptible (ssII). Sunrise 23 × Fulghum 47—susceptible (ssii). Guyra 51—susceptible (ssii) × Sunrise 23. Golden 84—susceptible (ssii) × Red Rustproof 11—resistant (SSii). Algerian × Calcutta 89—resistant (SSii) × Golden 84. The inhibitor for resistance was expressed only in the cross Sunrise 23 × Fulghum 41. The F_1 was susceptible, the F_2 segregated in the ratio of 3 resistant to 13 susceptible, and the F_3 progeny tests indicated distribution of the F_2 in the ratio of 7 homozygous-susceptible, 6 segregating-susceptible, 2 segregating-resistant, and 1 homozygous-resistant. In the remaining crosses the F_1 was resistant, the F_2 segregated in the ratio of 3 resistant to 1 susceptible, and

the F_3 progeny tests indicated the F_2 ratio to be 1 homozygous-resistant, 2 heterozygous-resistant, and 1 homozygous-susceptible. These results suggest the factorial analysis indicated above when S = resistant, s = susceptible, and I = inhibitor for resistance.

Reed (G. M.). **New physiologic races of the Oats smuts.**—*Bull. Torrey Bot. Club*, lvi, 9, pp. 449–470, 1929.

The author tabulates and discusses at some length the results of his investigations on physiological specialization in 15 different collections of *Ustilago avenae* and 9 of *U. levis* [*U. kolleri*] from widely separated localities. On the basis of the reaction of 28 varieties and strains of oats, belonging to seven different species, to these collections of loose and covered smuts, it was possible to distinguish eleven races of the former and five of the latter [*R.A.M.*, viii, pp. 487, 498].

Twelve of the 15 collections were found to be capable of infecting *Avena barbata*, which thus showed a very wide degree of susceptibility; the remaining three were not tested on this host. One race of *U. avenae* was able to attack only this species. *A. brevis* proved resistant to all the races of *U. avenae*, but showed more or less susceptibility to all those of *U. kolleri* except V (from Sui-Yuan, Inner Mongolia). Only the Welsh race II, however, produced severe infection on this species. Only two varieties of *A. sativa*, Black Mesdag and Markton, showed a conspicuous degree of resistance to all strains of both loose and covered smut. On the other hand, the Canadian and Victor varieties proved unusually susceptible to all but two or three races of both species of smut. The other varieties of *A. sativa*, together with those of *A. nuda*, *A. orientalis*, *A. sterilis*, and *A. strigosa*, showed varying degrees of susceptibility to one or more distinct races of loose smut. The Monarch and Joanette varieties of *A. sativa*, however, are more susceptible to covered than to loose smut.

It is of interest to note that there are sharply defined races of loose smut capable of attacking varieties of *A. sterilis*, one (IX, from Tennessee) being peculiar in its ability to infect Fulghum and another (X, from Texas) producing heavy infection on Red Rust-proof. *A. sterilis* did not suffer to any extent from infection by the races of covered smut used in these tests.

Prasad (H. H.). **A bacterial stalk rot of Maize.**—*Agric. Journ. India*, xxv, 1, p. 72, 2 col. pl., 1930.

A brief description is given, illustrated by two coloured plates, of a bacterial stalk rot of maize which broke out in the vicinity of Pusa after heavy rain in August, 1928, and again twelve months later. From diseased material an organism was isolated, inoculations with which gave positive results. This organism agreed with the description of *Phytomonas* [*Bacillus*] *dissolvens*, the cause of the bacterial stalk rot of maize in the United States [*R.A.M.*, vii, p. 28], being a non-motile, non-spore-bearing, Gram-negative, not acid-fast, rod-shaped, facultative anaerobe measuring approximately 1 by 0·7 μ. It liberated acid and gas in various carbohydrate media, and on nutrient agar rapidly produced white, round, glistening, opaque colonies.

Storey (H. H.) & McClean (A. P. D.). **A note upon the conidial Sclerospora of Maize in South Africa.**—*Phytopath.*, xx, 1, pp. 107–108, 1930.

A downy mildew of maize was observed in a small plot near Verulam, Natal, in January, 1924. The affected plants exhibited the typical symptoms of *Sclerospora* infection, viz., chlorosis and mottling of all the upper leaves, a well-marked jagged margin between the chlorotic and normal tissue of the lower leaves, erect habit of leaf growth, stunting and general weakness of the plants, and fasciated tassels in the older individuals. There was little evidence of the production of conidia during the daytime, but they readily developed on plants kept overnight in a saturated atmosphere [*R.A.M.*, ii, p. 360]. Subsequently some sorghum plants cultivated near the affected maize also contracted the disease.

The fungus was again observed in the three following years and further occurred in a sporadic form in many localities in the Natal Coast belt and in the Waterberg district of the Transvaal on maize, cultivated sorghum, and the wild perennial *Sorghum arundinaceum* [ibid., viii, p. 403]. Field maize was heavily damaged by *Sclerospora* in April, 1925, in the Transvaal, and in February, 1928, in Zululand.

Twelve out of 16 maize seedlings exposed to contact with conidium-bearing maize leaves in a saturated atmosphere in the greenhouse developed the symptoms of downy mildew. Positive results were also obtained on maize in 12 out of 30 cases (three different experiments) in which *Sorghum arundinaceum* was used as the source of infection. Possibly the wild host may play a part in the hibernation of the downy mildew fungus under South African conditions.

Bamberg (R. H.). **A bacterium antibiotic to Ustilago zeae.**—Abs. in *Phytopath.*, xx, 1, p. 140, 1930.

From maize plants inoculated but not infected with *Ustilago zeae* in the field at St. Paul, Minnesota, a bacterium was isolated that prevents normal infection and also destroys colonies of the smut fungus on artificial media. When maize was inoculated with certain lines of *U. zeae* about 70 per cent. of the plants developed normal infection, which was, however, almost entirely prevented by the addition of the bacterium to the inoculum. The bacterium may also destroy smut galls after they have been formed. On artificial media the colonies of *U. zeae* were destroyed in 10 to 14 days after inoculation, apparently through the disintegration of the sporidia. The bacterium further inhibits the development of colonies of *U. avenae*, *U. levis* [*U. kolleri*], *Sorosporium reilianum*, and *Tilletia tritici* [*T. caries*].

Wilson (J. J.) & Reddy (C. S.). **Fungicidal use of organic-mercury compounds containing furan derivatives.**—Abs. in *Phytopath.*, xx, 1, p. 118, 1930.

The seedling blight diseases of maize [*R.A.M.*, viii, p. 292] caused by *Diplodia* [*zeae*], *Basisporium* [*gallarum* : *Nigrospora sphaerica*], and *Gibberella* [*saubinetii*] were effectively controlled in three years' laboratory and field experiments by sterocide and three other

organic mercury compounds containing furan derivatives [cf. ibid., vi, p. 568]. The four different fungicides were prepared by varying the amount of furfuramide, mercuric chloride, mercuric nitrate, and ammonium hydroxide and sodium hydroxide in the Cannizzaro reaction. The new preparations, which were tested in talc at different rates in the laboratory and in the field, were found to be equally efficacious with the commercial compounds for seed-maize treatment now on the market. Control was particularly satisfactory at low temperatures.

KOEHLER (B.). **Development of Corn ear-rot from pure-culture inoculations.**—Abs. in *Phytopath.*, xx, 1, p. 118, 1930.

Open-pollinated yellow Dent maize was inoculated with *Diplodia zeae*, *Basisporium gallarum* [*Nigrospora sphaerica*], *Gibberella saubinetii*, and *Fusarium moniliforme* [*G. moniliformis*] (1) on the silk without disturbing the husks, (2) on the tip of the ear, husks opened to expose the ear tip, (3) beneath the outer husks towards the butt end of the ear, (4) in the shank about two inches from the ear, (5) in the leaf axil subtending the shank, and (6) in the stalk about one inch below the ear-bearing node. All the organisms caused infection through the silk and tip of the ear. Only *D. zeae* and *N. sphaerica* caused infection through the shank or down the husk, while the former alone invaded the plants through the leaf axil or stalk. *D. zeae* caused a high percentage of rot in all cases, susceptibility being highest during August. The action of the other fungi was more restricted both as regards the period and extent of infection.

LEONIAN (L. H.). **Dissociations and associations in some strains of Fusarium moniliforme.**—Abs. in *Phytopath.*, xx, 1, p. 144, 1930.

Numerous strains of *Fusarium moniliforme* [*Gibberella moniliformis*: *R.A.M.*, viii, p. 232] were isolated from maize plants showing root rot symptoms. These strains were shown by inoculation to possess varying degrees of pathogenicity. Some fifty variants were separated from a monospore culture of the most virulent of these strains. After discarding the less distinct types, there still remained 25 variants readily differentiable by their macroscopic appearance and often also by their degree of pathogenicity. The stability of the types was found to be only relative and highly variable, a given variant splitting into new types or reverting to the original without system or regularity. A perfect blend usually resulted from artificial mixtures in Petri dish cultures, the colonies derived from such arbitrary associations duplicating the natural dissociation types observed in plate cultures. When a purple form of these variants was mixed with an orange one, the latter representing a different isolation and undoubtedly a distinct strain, a perfect blend often resulted and selection for several generations was necessary to induce segregation of the types in pure form. In one instance the blending was so complete as to produce intermediate and new types not hitherto observed. So far these new types have retained their characteristics despite protracted selection.

Eddins (A. H.). **Dry rot of Corn caused by Diplodia frumenti and three morphologically related species.**—Abs. in *Phytopath.*, xx, 1, p. 139, 1930.

Diplodia frumenti causes an ear and stalk rot of maize in Florida, the dark brown mycelium of the fungus penetrating the cob, kernels, husks, and stalks. Invaded kernels and husks of severely moulded ears are blackened, as well as the pith of the stalks. Pycnidia are found on the nodes and internodes of the stalks, in the interior of the kernels, and embedded in stromatic mycelial masses on the ears and husks.

D. natalensis, *D. tubericola*, and *D. gossypina* also cause a dry rot of ears artificially inoculated in the dough stage, the symptoms of which are similar to those produced by *D. frumenti*. The four organisms are indistinguishable in their imperfect stages [cf. *R.A.M.*, vi, p. 127] and resemble one another in their nutritional reactions, temperature relationships, and growth on media of varying hydrogen-ion concentrations. They further produce the same type of rot in oranges, grapefruit, sweet potatoes, and watermelons.

Melchers (L. E.), Ficke (C. H.), & Johnston (C. O.). **Physiologic specialization in Sphacelotheca sorghi.**—Abs. in *Phytopath.*, xx, 1, pp. 142–143, 1930.

Three years' experiments with 80 varieties, selections, and hybrids of the principal groups of sorghum have demonstrated the existence of at least three physiological forms of kernel smut (*Sphacelotheca sorghi*) [*R.A.M.*, vi, p. 664; viii, p. 427]. Varieties of kafir, sorgo, broomcorn, and kaoliang, as well as miscellaneous sorghums, are attacked by all three physiological forms. Form I does not attack milo, hegari, and feterita; II infects milo and hegari, but not feterita; and III is found on feterita and certain of its hybrids, but not milo. Certain Red Amber × feterita hybrids and Spur feterita are as yet immune from all three forms. Twenty-three varieties show definite differential reactions and have been classified in seven groups, arranged in a dichotomous key for the identification of physiological forms of *S. sorghi*, as follows: one group attacked by all three forms; one attacked only by form II; one resistant to all three forms; one susceptible to I and III and resistant to II; one resistant to I and II and susceptible to III; one susceptible to I and II and resistant to III; and one resistant to I and susceptible to II and III.

Staner (P.). **Maladies du Citrus au Congo belge.** [Citrus diseases in the Belgian Congo.]—*Bull. Agric. Congo Belge*, xx, 3, pp. 364–373, 7 figs., 1929. [Received March, 1930.]

Brief notes are given on the more serious diseases which affect citrus trees in the low-lying areas of the Belgian Congo. Gummosis (*Pythiacystis* [*Phytophthora*] *citrophthora*) only occurs at altitudes below 1,000 m., mainly on oranges (*C. aurantium*), tangerines (*C. nobilis*), and limes (*C. medica* var. *limonum*); *C. bigaradia* and a native variety of lime (*C. medica* var. *acida*), with small and very acid fruits, show relative resistance to the

disease. *Limonia poggei* var. *latialata*, which is an indigenous Congo plant, is very rarely attacked and the author recommends its use as a stock for grafting with scions of susceptible species in infected areas. At Eala the leaves and petioles of oranges grafted on *C. bigaradia*, and the shoots of the latter species, are often affected by scab caused by *Sporotrichum citri*. Anthracnose (*Colletotrichum gloeosporioides* and *Gloeosporium limetticolum*) was recorded in several districts, but does not appear to do any great damage. Orange fruits are occasionally rotted by *Penicillium italicum* and *Phytophthora citrophthora*, and limes by *Penicillium digitatum*.

Lepidosaphes beckii, a coccid which occurs on oranges at Eala, was frequently found to be attacked by an unidentified species of *Aschersonia*; this fungus in nature appears as an agglomeration of white mycelium, in which is immersed a red stroma bearing pycnidia with one-celled, falcate, hyaline conidia, 50 to 55 by 5 μ in diameter.

McDonald (J. H.). **Coffee growing: with special reference to East Africa.**—205 pp., 25 pl., 1 fig., 2 diags., *East Africa*, London, 1930.

This book, the work of a coffee planter anxious to give practical assistance to his fellow-planters, may be commended as including an up-to-date and comprehensive account of the troubles experienced by the planter in consequence of fungous diseases and insect pests, the foremost of which are enumerated, with brief notes on their causes, symptoms, and control. Other aspects of coffee growing treated in this manual include a brief history of the plant, a full description of its cultivation, observations on manuring, picking and preparation, the estimated cost of coffee production, and directions for the preparation and application of some standard fungicides and insecticides.

Stoughton (R. H.). **The morphology and cytology of Bacterium malvacearum E.F.S.**—*Proc. Roy. Soc. London*, Ser. B., cv, B739, pp. 469–484, 3 pl., 2 figs., 1929.

This is an account of the author's morphological and cytological study of a strain of *Bacterium malvacearum* isolated from infected cotton seed from the Sudan. Although hitherto the organism has always been described as having no internal structure or reproductive bodies, in preparations stained without previous drying or fixing of the bacteria [by a technique which is described] it was observed to possess several internal structures and a variety of morphological forms, the significance of which is fully discussed. The bacterium contains a central structure apparently passing through a division cycle, suggestive of nuclear division, and correlated with the division of the cell. There are also present small granules with a strong affinity for basic dyes; these granules are formed in the cell wall and are liberated by extrusion, or grow out on a stalk, from the apex of which they are freed, and they are stated to resemble the gonidia of other writers. In old cultures the organism was also observed to form coccus-like bodies, giant cells, and other atypical morphological forms. Similar formations

were also seen in a number of other strains of *Bact. malvacearum* obtained from America and China.

STOUGHTON (R. H.). **Angular leaf-spot disease of Cotton.**— *Nature*, cxxv, 3149, pp. 350–351, 1930.

In order to test the validity of the recently advanced hypothesis that black arm or angular leaf spot disease of cotton (*Bacterium malvacearum*) may involve systemic infection without any external symptoms except where environmental conditions favour their development [*R.A.M.*, viii, p. 568], the writer conducted a series of experiments, at the Rothamsted Experimental Station, on cotton plants growing in a specially constructed apparatus enabling soil and air conditions to be independently controlled.

Cotton seed from the Sudan, derived from heavily infected plants and thus, on the basis of the above theory, presumably internally infected, was grown at varying soil temperatures with all other environmental factors constant. Seed subjected to thorough external disinfection produced seedlings showing no sign of disease at any temperature, while those from untreated seed showed a slight amount of infection, which reached its maximum at 27° C. Plants from seed soaked in a strong suspension of the organism showed a considerably greater degree of infection, again with a maximum at 27° C. but with a certain amount even at 40° C. (several degrees above the maximum at which *Bact. malvacearum* has been grown in pure culture). Finally, seed in which the organism had been artificially introduced within the seed coat produced seedlings which were nearly all infected at all temperatures, even up to 40° C. These results lend no support to the theory of natural internal infection, but indicate that primary infection arises from the attack of bacteria present on the outside of the seed.

In order to test the theory of latency of the parasite within the plant, the same seedlings that had shown primary infection were allowed to continue their growth under conditions favouring the development of the disease, as shown by the fact that adjacent plants sprayed with a pure culture of the organism contracted heavy infection. In no case did the unsprayed plants show any further disease in the newly formed stems and leaves, as would be expected were the theory of internal spread correct. Laboratory attempts to isolate *Bact. malvacearum* from the tissues of the embryo have also given consistently negative results, but on one occasion it was obtained from between the seed coat and the embryo.

An interesting and possibly important point in connexion with the life-history of the angular leaf spot organism is the fact that it manifests the phenomenon of 'dissociation' [ibid., ix, p. 205]. At least three 'dissociates' have been isolated, all of which are culturally, and to some extent morphologically, quite distinct, one being possibly identical with the so-called 'common yellow saprophyte of cotton' [ibid., viii, p. 570]. These 'dissociates' arise in single-cell cultures, and are apparently produced in an obligate order, 'A' producing 'B', 'B' 'C', and so forth; there is some indication that the cycle may be a closed one.

Zaprometoff (N. G.). Болезни Хлопчатника. [Diseases of the Cotton plant.]—*Научно-исследоват. Инст. по хлопководству. Серия изучения вредителей и болезней Хлопчатника.* [*Sciert. Res. Inst. for Cotton Industry. Study series on Cotton pests and diseases*], Tashkent, issue 1, 34 pp., 22 figs., 1929. [English summary.]

In this pamphlet brief accounts are given of the principal parasitic diseases and physiological troubles of the cotton plant and cotton lint in Russian Central Asia [cf. *R.A.M.*, vii, p. 374]. Extensive surveys have shown that wilt (*Fusarium vasinfectum*) is steadily spreading; in 1928, in particular, it was found in practically all the cotton plantations of Uzbekistan [formerly Russian Turkestan], especially on the lighter soils; it was noted, however, that on soils with a high content of common salt, e. g., in the Golodnaya Steppe, the incidence of wilt is very slight. Under local conditions the fungus does not form cankers or wounds on the collar of the cotton plants, and it was never seen to fructify on living plants in nature. There was, however, experimental evidence that both micro- and macroconidia may be formed in the spring on dead infected cotton stems remaining over winter in the field, this forming a probable source of aerial infection at the renewal of vegetation, although the disease is chiefly carried in the soil, in which the fungus is apparently capable of living indefinitely as a saprophyte on dead plant débris. It is believed that the local strain of *F. vasinfectum* may be different from the strains that have been described from other cotton-growing countries. In Central Asia the wilt disease has been recorded also on a number of other cultivated plants, but so far only the strain from *Hibiscus esculentus* has been found capable of infecting cotton. All cotton varieties cultivated in the locality appear to be more or less susceptible to wilt, although some exhibit a relatively high degree of resistance. The control measures recommended are the removal and destruction by fire of all cotton plants and débris after the harvest, the replacement of stable manure by artificial fertilizers, since it has been shown that stable manure greatly increases the incidence and virulence of the disease, the avoidance of too abundant irrigation, and the use of resistant varieties.

Collar canker (*Fusarium buharicum*) [see next abstract] was very prevalent in 1928 on all varieties of Asiatic cotton (*Gossypium herbaceum*), of which the Bokhara variety appears to be the most susceptible. The disease differs from the wilt due to *F. vasinfectum* chiefly in its acute character, the diseased plants being very rapidly killed, and in the formation of definite swellings or cankers at the collar; the cankers are usually covered with a slight pale to dark blue black, dark green, pink, or white efflorescence of conidia, the blue colour being predominant. Infection may occur during the whole period of vegetation of the host, and artificial inoculation experiments have shown that it may take place either from infected seeds to the seedlings or through wounds in the developing plants. In these experiments the incubation period was from $2\frac{1}{2}$ to $3\frac{1}{2}$ weeks in the case of infected seed, and from $1\frac{1}{2}$ to $3\frac{1}{2}$ weeks in inoculations through wounds. In heavily infected areas the death rate may be as high as 70 per cent., and cases were also recorded when

the whole crop was lost. So far all the American varieties (uplands) of cotton tested have proved to be immune from *F. buharicum*, even when sown together with infected Asiatic varieties.

Both American and Asiatic varieties of cotton also suffer, although to a somewhat lesser degree than from the two diseases above-mentioned, from angular leaf spot and black arm disease (*Bacterium malvacearum*) [see preceding abstracts]. Of minor economic importance are root rots, usually found to be associated with species of *Fusarium*, *Verticillium*, *Rhizoctonia*, and an undetermined species of *Aegerita* (according to unpublished data the last-named fungus was very prevalent in 1929); black root rot caused by *Thielaviopsis basicola* [ibid., viii, p. 613]; a leaf spot caused by *Phyllosticta gossypina* [ibid., vii, p. 375], and sooty moulds. All the diseases of cotton lint dealt with are included in Jaczewski's recent paper [ibid., ix, p. 307].

Letoff (A. S.). Новый вид **Fusarium** на Хлопчатнике. [A new species of *Fusarium* on Cotton plants.]—Reprinted from *Материалы по Микол. и Фитопатол.* [*Materials for Mycol. and Phytopath.*], Leningrad, viii, 1, 12 pp., 1 pl., 1929.

A brief account is given of an apparently hitherto undescribed disease which was observed in 1928 attacking cotton plants at the Kara-Tchala Cotton Seed Nursery in Azerbaijan [south-east Russia]. The sole outward symptom of the disease was the sudden wilting and death of healthy and vigorous cotton plants at the stage of flowering (end of July to middle of August), the process rapidly extending around the initial infection foci even after the removal of the first dead plants. Examination of the latter showed that the vascular bundles in the roots and lower portions of the stems (occasionally also the parenchymatous tissues) contained hyaline or brownish hyphae, 3 to 4·5 μ in diameter, while some stems were found to bear externally pale blue or green sporodochia of a species of *Fusarium* belonging to the *Martiella* section. In pure culture the fungus is characterized by a profuse, rapidly growing, dense, white aerial mycelium. Substrata such as gelatine or agar-agar acquire an intense blue colour, but on potato or carrot slices the pigment formation is much weaker, and is entirely lacking on *Melilotus* stems. The aerial mycelium produces hyaline, ovate (predominant), elongated, reniform, or comma-shaped, mostly one- but occasionally two- or three-celled microconidia in heads. The one-celled microconidia measure 6·6 to 20 by 1 to 6·6 μ and the two- or three-celled ones 18 to 33 by 4 to 8·2 μ. Globular intercalary or terminal chlamydospores, 8 to 16·5 by 8 to 11·6 μ, also occur in the aerial mycelium either singly or in chains. In older cultures macroconidia are formed on mycelial strands, sporodochia, pseudopionnotes, and coremia. The macroconidia are hyaline when seen singly under the microscope, but in mass they vary from dirty greyish-yellow or dirty sky-blue to dark blue with age. The normal mature macroconidia are slightly curved, rounded at both ends, narrower at the base than at the apex, with an indistinct pedicel, mostly (85 to 99 per cent.) three-septate (33 to 47 by 3 to 6·6 μ), more rarely with one or two septa (22 to 35 by 3 to 6·6 μ) or with four or five septa (40 to 55 by 3 to 6·6 μ). The

conidiophores are simple or dendritically branched. The macroconidia germinate at both ends and anastomosis of the germ-tubes was observed. In old, drying-up cultures one or two globular, one-celled chlamydospores, 9 to 13 by 6 to 10 μ, may be formed in the macroconidia. No stroma was seen. The fungus is considered to be new to science and is named *F. caucasicum*.

In describing the main differences between the new species and *F. coeruleum* [*R.A.M.*, viii, p. 518], *F. solani* [ibid., viii, p. 803], and *F. buharicum* Jacz. [the emended spelling adopted by the author, in agreement with Jaczewski, for *F. bucharicum*: ibid., viii, p. 339], it is stated that in the last-named species the aerial mycelium is almost entirely lacking on all media; its fructifications are typical pionnotes, light pinkish-brown and later black on agar-agar, pinkish-red on rice, and greenish-blue on potato slants and *Melilotus* stems. The macroconidia, which produce an abundance of chlamydospores, are slightly curved, mostly (50 to 70 per cent.) five-septate (38 to 54 by 4·5 to 7·5 μ), more rarely with 3 (30 to 49 by 4·5 to 7·5 μ) or 4 septa (34 to 43·5 by 6 to 7·5 μ). Sclerotial bodies are formed by *F. buharicum* both in nature and in cultures.

The pathogenicity of *F. caucasicum* [a Latin diagnosis of which is given] was tested in 1929; it proved to be very virulent on the cotton varieties Triumph-Navrotzky and 182, both by soil and direct seedling inoculation, less on the varieties Navrotzky and 169, and failed to produce infection on Bokhara cotton [*Gossypium herbaceum*]. Most of the cotton seeds sown in inoculated soil failed to germinate, and were found to have rotted in the soil.

Shapovalov (M.) & Rudolph (B. A.). **Verticillium hadromycosis (wilt) of Cotton in California.**—*Plant Disease Reporter*, xiv, 2, pp. 9–10, 1930. [Mimeographed.]

Verticillium hadromycosis or wilt of cotton [*R.A.M.*, viii, p. 378] was first observed near Wasco in the southern San Joaquin valley of California in September, 1927. Before 1923 this field was planted with lucerne and barley, and from 1923 to 1926 it was in cotton, with watermelons interplanted in 1925. Potatoes were planted in the spring of 1927 but were afterwards replaced by cotton. The wilt disease having been noticed for the first time after the potato planting, it is thought probable that the fungus was introduced into the soil with this crop. *Verticillium* wilt was detected in small quantities in several fields in 1928, and during the current season the disease has assumed an alarming character, 50 per cent. of the crop being affected in one case. The cultural characters of the *Verticillium* isolated from wilted cotton stems agree, apart from certain minor variations, with those of *V. albo-atrum*.

Ezekiel (W. N.) & Taubenhaus (J. J.). **Soil reaction as influencing Phymatotrichum root rot.**—Abs. in *Phytopath.*, xx, 1, p. 117, 1930.

Cotton was planted in rows 12 ft. long in boxes of seven different soils, and root rot (*Phymatotrichum*) [*omnivorum*: *R.A.M.*, ix, p. 108] induced by inoculation at one end of each row. The disease spread furthest in soils of P_H 7·6 and 7·7, but attacked only

one inoculated plant in acid soils (P_H 5·5 and 5·8), the effects in soils of P_H 6·3, 6·7, and 7·1 being intermediate. Three other inoculation experiments yielded similar results, confirming the outcome of previous field surveys, and showing that root rot is destructive in alkaline soils but unimportant in acid ones [ibid., viii, p. 308]. The addition to the soil of excessive quantities of sulphur produced an acid reaction and a consequent decrease of infection, but this method is still in the experimental stage and cannot yet be recommended for general use.

James (L. H.) & Swenson (T. L.). **A study of pin spot moulding on shell eggs in cold storage.**—*Journ. of Bact.*, xix, 1, p. 55, 1930.

Two types of mould, a *Penicillium* and a *Cladosporium* [*R.A.M.*, vii, p. 166], were isolated from the exterior surfaces of eggshells showing a new type of mould spoilage, known as pin spot. Eggs from California, Washington, and the Middle West were subjected to various treatments, inoculated with the *Cladosporium*, and placed in the usual cold storage. It was found that only the eggs stored in cases made of unseasoned wood developed the characteristic black colonies. Eggs shipped from California to New York in unseasoned cases showed definite pin spot moulding on arrival, and in subsequent storage the blemish developed to a marked degree. Evidently the development of the condition in cold storage depends on the previous existence of factors favouring the germination of the fungal spores.

Gilbert (Ruth) & Groesbeck (W. M.). **A study of cultures of Monilia isolated from sputum.**—*Amer. Journ. Public Health*, xx, 1, pp. 1–6, 10 figs., 1930.

Working at the Division of Laboratories and Research, New York State Department of Health, Albany, the writers have isolated strains of *Monilia* [? *Candida*] pathogenic to white rats from the sputum of 11 patients. Brief notes are given on the clinical manifestations of these cases, two of which, described in greater detail, resembled tuberculosis. Species of *Monilia* pathogenic to rats have further been isolated from the exudate of two cases of thrush [*R.A.M.*, viii, p. 444] and one of vaginitis, as well as from the faeces of a patient suffering from diarrhoea for eight months.

Morphologically the fungi resembled yeasts, having elliptical cells, reproducing by budding, while short hyphae were also often formed. By intravenous inoculation one-twentieth or less of the 24-hour growth on an agar slant is usually fatal to white rats and small rabbits in 1 to 5 days. The kidneys of rats killed by these organisms show extensive granular degeneration, and their surface is profusely dotted with raised yellowish-white areas, about 1 mm. in diameter. The Gram-Weigert stain reveals masses of fungi throughout the kidney, especially in the cortex. The cellular elements appear as globules, 1 to 12 μ in diameter, staining pale to deep violet, and numerous short hyphae up to 30 μ in length. The myocardium, liver, and brain are similarly affected, while the condition of the lung resembles that of the early stages of pneumonia.

Cultures of the fungi can usually be obtained from these organs and from the heart's blood.

In order to determine whether the injuries to the tissues were primarily due to mechanical plugging of the capillaries by the large *Monilia* cells, some animals were intravenously inoculated with massive doses of *Saccharomyces cerevisiae* [ibid., ix, p. 109], the cells of which are about the same size or a little larger. These experiments gave negative results.

As the organisms found in the cases of thrush resembled those in the cases with pulmonary symptoms, it is concluded that the patient's vitality must be markedly lowered before infection occurs.

PRIBRAM (E.). **Studies on fungi of the genera Candida, Cryptococcus and Mycoderma isolated from the skin of an epidemic perlèche.**—*Journ. of Bact.*, xix, 1 p. 31, 1930.

In this paper (read at the thirty-first annual meeting of the Society of American Bacteriologists, held at Ames, Iowa, from 30th December, 1929, to 1st January, 1930) the writer states that fungi belonging to the genera *Candida*, *Cryptococcus*, and *Mycoderma* were isolated in 77 out of 100 cases of a perlèche epidemic in Chicago. This is a contagious disease involving the labial commissures of children's mouths, resulting in a desquamation of the epithelium.

PANAYOTATON (ANGELICA). **A case of Castellani's bronchomoniliasis with Monilia alessandrina as the aetiological agent.**—*Journ. Trop. Med. & Hygiene*, xxxiii, 2, pp. 17–18, 1930.

A case of bronchomoniliasis in a 42-year-old American woman resident in Alexandria is reported, with clinical notes and a brief account of the causal organism, *Monilia alessandrina*, which was isolated from the sputum. The fungus consists of oval, yeast-like cells, 3 to 4 μ in diameter, and forms large white colonies on Sabouraud's medium. The biochemical characters are briefly described. The fungus proved extremely pathogenic to a rabbit given an intravenous injection of it.

JAUSION, SOHIER, & HYRONIMUS. **Pityriasis versicolor achromiant.** [Achromatic pityriasis versicolor.]—*Bull. Soc. Franç. de Dermatol., 1930*, 2, pp. 233–238, 1 fig., 1930.

The hyphae of *Malassezia furfur* [*R.A.M.*, ix, p. 244] were detected in the practically pure white, oval or round patches on the upper part of the body of a youth who had been constantly exposed to the sun for three months at the seaside. The typical brown lesions on the protected parts of the body contained the same organism. The etiology of the condition is discussed.

BRUHNS (C.). **Über die Frage der Askenbildung bei Trichophyten und Achorien bei dem Verfahren nach Wilenczyk und über 'organes nodulaires'.** [On the question of ascus formation in *Trichophyton* and *Achorion* by Wilenczyk's method and on '*organes nodulaires*'.]—*Dermatol. Wochenschr.*, xc, 2, pp. 49–53, 4 figs., 1930.

Repeated attempts to secure ascus formation in *Trichophyton*

gypseum asteroides and *T. g. granulosum* by Wilenczyk's method (based on the desiccation of the medium and alternations of temperature) [*R.A.M.*, ix, p. 182] gave negative results. The same was true also of isolated experiments on similar lines with *T. cerebriforme*, *T. fumatum*, *Microsporon audouini*, and *M. lanosum*. On the other hand, the cultures contained some yellowish-brown bodies simulating spores but in reality consisting merely of fragments of the medium, and also the so-called '*organes nodulaires*', originally described by Sabouraud in 1894, which are composed of clumps of spores and mycelium. There is no reason to suppose that these bodies represent the incipient stage of ascus formation.

Muende (I.). **Conjunctivitis as a trichophytide manifestation.** —*Brit. Journ. of Dermatology*, xlii, 495, pp. 26–33, 1 fig., 1930.

Particulars are given of a case of deep-seated trichophytosis of the scalp, accompanied by lesions on the neck and body, in a ten-year-old boy examined at the Dermatological Clinic of Zürich University in 1929. The child came from a farm on which one of the cows was suffering from a skin disease, apparently of fungous origin, and subsequently the patient's sister also developed a *Trichophyton* infection of the scalp. At the outset the trichophytine reaction [*R.A.M.*, vi, p. 613; vii, p. 637] was almost negative, but 16 days after exposure to an epilating dose of X-rays the boy developed a generalized trichophytosis resembling chicken-pox, and also an acute conjunctivitis of both eyes, the latter being apparently an extremely rare concomitant of *Trichophyton* infection. These conditions, which were accompanied by general *malaise* and rise of temperature, gradually retrogressed within 15 days. About a week after the disappearance of the symptoms, however, a fresh eruption of an urticarial nature developed. A strongly positive trichophytine reaction was given at this stage. The body lesions assumed the characteristics of lichen trichophyticus and another area of infiltration developed on the scalp, with pus formation. A cure was effected by local treatment.

Peck (S. M.). **Nachweis von Epidermophyton im Blut in einem Falle von primärer, exogener Fussmykose mit sekundärem, hämatogenem, dyshidrotischem Epidermophytid an den Händen.** [Detection of *Epidermophyton* in the blood in a case of primary, exogenous, foot mycosis, with secondary, haematogenous, dysidrotic epidermophytid lesions on the hands.]— *Klin. Wochenschr.*, viii, 41, p. 1905, 1929.

Kaufmann-Wolf's *Epidermophyton* was obtained in pure culture from the lesions on the feet of a male patient [*R.A.M.*, ix, p. 36]. Three weeks after the onset of the condition, symptoms of dysidrosis developed on both hands, but repeated attempts to isolate the fungus from the blisters and pustules gave negative results. Two hours after an injection of trichophytine, blood cultures were started on maltose agar, and these yielded a fungus which proved to be identical with that isolated from the primary lesions on the feet. This experiment is considered to furnish the proof (hitherto

lacking) that the development of dysidrotic and squamous epidermophytid lesions on the hands may be due to the transport through the blood stream of living fungous elements from the primary mycoses on the feet.

Hopkins (J. G.), Benham (Rhoda W.), & Kesten (Beatrice M.). **Asthma due to a fungus—Alternaria.**—*Journ. Amer. Med. Assoc.*, xciv, 1, pp. 6–10, 1 fig., 1930.

The authors' patient, a 37-year-old man, suffered from frequent attacks of asthma in places where mould spores were abundant. He showed extreme skin sensitiveness to a strain of *Alternaria* of the *A. tenuis* group which was isolated from a house where such attacks had occurred. Asthmatic symptoms were induced in the patient by the extract of this fungus in powdered form and also by the broth in which it had been grown. An attack was further induced by the dry powder of a species of *Circinella* isolated from another room in the same house, but no marked skin reaction was given in this case.

Rodenhiser (H. A.). **Physiologic specialization in Phlyctaena linicola.**—Abs. in *Phytopath.*, xx, 1, pp. 144–145, 1930.

Phlyctaena linicola, the cause of pasmo disease of flax [*R.A.M.*, vii, p. 796], comprises several physiological forms, four of which have been isolated from flax grown in different parts of Minnesota, and many more from sectors appearing in colonies on artificial media. Colonies of monosporidial lines may be distinguished by colour, topography, surface, consistency, type of margin, degree of conidial production, and varying growth rate at different temperatures. Five varieties of flax were inoculated in the greenhouse with four culturally distinct monosporidial lines, but there were no perceptible differences in pathogenicity. In the field, however, there were differences in the degree of infection caused by a monosporidial line producing abundant conidia and by another arising as a sector therefrom. The range of susceptibility to pasmo disease in a large number of flax varieties and selections was very wide.

Ocfemia (G. O.). **Bunchy-top of Abacá or Manila Hemp. I. A study of the cause of the disease and its method of transmission.**—*Amer. Journ. of Botany*, xvii, 1, pp. 1–18, 4 pl., 1930.

The results of the author's investigations, begun in April, 1925, on the etiology and transmission of bunchy top of abacá (*Musa textilis*) in the Philippine Islands [*R.A.M.*, viii, p. 25] are fully described.

The disease occurs in a most destructive form in the Laguna and Cavite Provinces, where the cultivation of the crop has been largely abandoned in consequence of its ravages. Bunchy top first attracted attention at Silang, Cavite, in 1915, but did not assume its present virulent character until 1923. Infected plants are severely stunted and rarely produce pseudo-stems a metre long; they usually survive the initial attack for two years or more, but the entire diseased stool becomes useless and acts as a constant and dangerous source

of contamination unless removed from the field. The disease spreads with great rapidity, and in Cavite about 95 per cent. of the abacá fields are almost completely destroyed, the loss from this cause being estimated at 88 to 90 per cent.

The first symptoms of bunchy top are chlorotic areas on the leaf margin, and transparent streaks and dark green lines along the primary and secondary veins. The dark green streaks range from mere dots to lines $2\frac{1}{2}$ cm. in length. The green areas of the leaves, petioles, and leaf sheaths of diseased abacá plants are darker than the normal. The leaves gradually become shorter, narrower, and stiff, with an upward curl along the margin; and they tend to unfurl earlier than those of healthy plants. The inner leaf sheaths make little growth in length, and in some cases remain shorter than those of the outer portion, with the result that the leaves bunch conspicuously at the upper portion of the pseudostem. In advanced stages of the disease some of the plants are unable to expand their youngest leaves, which turn brown, die, and rot. The death and decay of the leaves begin from the chlorotic areas, which are at first almost white, and later turn into transparent, brown, dead tissues. Many of the roots also die and rot in the later stages of bunchy top.

The aphid *Pentalonia nigronervosa* has been shown [by experiments which are fully described] to act as the vector of the disease from plant to plant. The winged forms of the aphid can fly short distances, but in the field they are chiefly disseminated by ants (*Ragiolepis longipes* and *Dolichoderus bituberculatus*). The incubation period of the disease in the abacá varieties studied varied from 18 to 28 days. Among the varieties to which bunchy top was experimentally transmitted were Pinoonan, C.A. 10302, C.A. 4293, Itom, Moro, Inosa, Ihalas, Ilayas, C.A. 4279, Sinamoro Puti, Sinamoro Pula, and Santa Cruz. Attempts to transmit the disease through the soil, by sap injection, or by insertion of crushed diseased tissues, gave negative results.

KUNKEL (L. O.). **Transmission of Sida mosaic by grafting.**—Abs. in *Phytopath.*, xx, 1, pp. 129–130, 1930.

A mosaic disease common on *Sida rhombifolia* and other species of *Sida* in Florida and Haiti is not transmitted by ordinary mechanical methods, but is readily conveyed by budding or grafting. The disease, which is not seed-borne, closely resembles the mosaic of *Abutilon striatum* var. *thomsoni* [*R.A.M.*, vii, p. 385; viii, p. 662].

WHITE (R. P.). **An infectious chlorosis of Rose.**—Abs. in *Phytopath.*, xx, 1, p. 130, 1930.

Since 1927, 25 hybrid tea varieties of rose grown under glass from eight States and eastern Canada have been found affected by chlorosis of the leaves [*R.A.M.*, vii, p. 721], which in 1929 was also observed occurring naturally on eastern outdoor roses. In addition to the hybrid tea varieties, *Rosa manetti* has also been found naturally infected. The disease has further been experimentally transferred to *R. multiflora*, but attempts to communicate it to

R. odorata and to the Pernetiana and *R. polyantha* types were unsuccessful. Chlorosis has been transferred to healthy plants by means of budding from diseased individuals, the symptoms appearing after a month on the new growth, sometimes at a considerable distance from the point of bud insertion. Insect transfer has hitherto failed.

Nelson (R.). **Infectious chlorosis of the Rose.**—Abs. in *Phytopath.*, xx, 1, p. 130, 1930.

An infectious chlorosis of the hybrid tea and other rose varieties [see preceding abstract] has been present in the commercial houses of Michigan for at least four years, and a recent survey indicates that it is increasing in importance. In one house 9,000 plants of the Matchless variety were destroyed by the disease, the symptoms of which include stunting of the plant, dwarfing or malformation of the leaflets, curling and leaf mottling ranging from faint mosaic speckling to extensive chlorosis along the veins, and an almost complete absence of saleable flowers. Many popular hybrid tea varieties are affected, as well as pure and hybrid Pernetianas, and the condition is being widely disseminated through commerce in diseased *Rosa manetti* and Ragged Robin stocks, the percentage of infection in which has been found to vary between 10 and 100. Chlorosis has been transmitted from diseased to healthy plants by budding and grafting, but not by insects.

Howe (T. D.). **A bacterium associated with bundle blackening in the Balsam, Impatiens balsamina.**—*Phytopath.*, xx, 1, pp. 108–109, 1930.

During the summer of 1924 a number of balsam (*Impatiens balsamina*) plants in a greenhouse at Wisconsin University showed a rotting of the stem bases and a black discoloration of some of the vascular bundles, from which was isolated a medium-sized, actively motile bacterium forming hyaline colonies on nutrient agar. Positive results were given by inoculations through stem punctures, made below soil level, with a needle dipped in a pure culture of the bacterium. Bundle blackening occurred with great rapidity, extending to the tops of the plants, a distance of four to six inches, within 48 hours. The black lines were visible through the translucent stem.

Bunz-Freising (W.). **Bekämpfung des Cinerarien-Mehltaues durch Vorbeugung.** [Control of Cineraria mildew by preventive measures.]—*Gartenwelt*, xxxiv, 3, p. 33, 1930.

Directions are given in popular terms for the control of cineraria mildew [(?) *Erysiphe cichoracearum*: *R.A.M.*, iv, p. 36] by appropriate cultural measures, with special attention to thorough ventilation. The temperature of the greenhouse should be kept low, and the plants should be widely spaced and kept moderately dry. Once the fungus has gained a foothold in the greenhouse control is not easily effected. In addition to the removal of all diseased plants it is advisable to spread a thin layer of a mixture of pounded roll sulphur and loam over the heating pipes.

Voglino (P.). **La moria o peste dei Ciclamini (Thielavia basicola Zopf).** [The blight or pestilence of Cyclamens (*Thielavia basicola* Zopf).]—*La Difesa delle Piante*, vi, 6, pp. 1–6, 2 figs., 1929.

In October, 1929, the author observed Dutch *Cyclamen persicum* plants in a greenhouse near Turin to be affected by a serious wilt and root rot due to infection of the roots by *Thielavia basicola* [*R.A.M.*, v, p. 557]; the leaves were yellowed and rotting, the peduncles withered, and the roots, which were turned fuliginous-chestnut with black lesions, readily crumbled away when the plants were lifted out of the pots.

The hyaline, then yellow or chlorine-fuliginous, branched, multiseptate hyphae, which averaged 3 μ in diameter, invaded the epidermis, the immediately underlying cells, and nearly all the cortical parenchyma, but were very few in the endodermis and the central cylinder. In the epidermis they were arranged in bundles of two or three, with dichotomous terminal branches, and similar bundles extended into the soil. In the epidermis the hyphae were intercellular, but in the outer part of the cortex they penetrated and destroyed the cells. The conidiophores, which were borne on lateral branches, were tubular, clavate at the base, cylindrical, open at the apex, septate, measured 60 to 80 by 5 to 6 μ, and liberated 3 to 5 elongated, ellipsoidal, hyaline endoconidia, measuring 6 by 4 μ.

From the hyphae between the epidermis and the cortical parenchyma arose greyish branches, 20 to 30 by 6 μ, 4- to 6-septate, bearing multiple, toruloid, dark macroconidial chains, 35 to 64 by 10 to 22 μ, divided into 4 to 7 loculi which became disarticulated into grey-fuliginous, regular, cylindrical conidia, 10 to 12 μ in diameter. Hyaline, then dark, subglobose, continuous, membranous perithecia, not exceeding 130 μ in diameter, were also observed; they generally contained 5 ovoid asci, 30 to 40 by 20 to 25 μ, with 8 brownish, lemon-shaped ascospores measuring 8 to 10 by 4 to 5 μ.

The control measures recommended include the mixing of siliceous sand and sterilized solutions of mineral fertilizers with the potting mould; the examination of the plants for diseased roots and the removal of the latter before placing in the greenhouse; and the disinfection of the pots with a 1 per cent. solution of copper sulphate and lime. If these measures fail, resistant varieties must be sought.

Mundkur (B. B.). **A wilt of African Daisy.**—Abs. in *Phytopath.*, xx, 1, p. 129, 1930.

The xylem vessels of the tap roots and stems of African daisy [or Cape marigold] plants (*Dimorphotheca aurantiaca*), growing in greenhouses at the Iowa State College, were found, in the spring of 1929, to be invaded by a species of *Verticillium* resembling *V. albo-atrum* in cultural and morphological characters. The symptoms caused by the fungus were those of a wilt disease. The inoculation of seedlings with pure cultures of the *Verticillium* gave positive results, which were also obtained by the cultivation

of the African daisies in steam-sterilized soil inoculated with the fungus.

VERPLANCKE (G.). **Une maladie 'à virus filtrant' des Anthurium.** [A filterable virus disease of *Anthurium*.]—*Comptes rendus Soc. de Biol.*, ciii, 7, pp. 524–526, 1930.

Greenhouse plants of *Anthurium andraeanum* and *A. scherzerianum* in various parts of Belgium have been found to suffer from a pathological condition, of which three types may be distinguished. (1) Greyish-white, necrotic spots, composed of undulating lines 2 to 5 mm. in width, develop on the upper leaf surface, mostly parallel to the main axis. Young leaves show similar necrotic spots on the lower surface, the upper being also involved in very severe cases; this is followed by curling, stunting, various malformations, and premature death. (2) Long, pale yellow lines, 1 mm. wide at the most, more undulating than in type (1) and also more localized, occur on *A. scherzerianum* only. (3) Pale yellow spots, most visible when the leaves are held up to the light, develop on *A. scherzerianum*. The only insects present in the affected houses were thrips and red spider.

The juice extracted from the leaves of plants affected with these types of disease was inoculated, by rubbing and wounding, into the leaves and stems of *A. scherzerianum* and a number of other plants. The new leaves of *A. scherzerianum* inoculated with all three types of virus developed, after 26 days, elongated necrotic spots, mainly on the lower surface. Mature leaves were not affected. The leaves of *Monstera deliciosa* inoculated with the three types of virus developed, after 28 days, very narrow, long, sinuous, pale yellow depressions, which were also observed at the end of 41 days on the stalks of inoculated plants. The symptoms occurred on a leaf situated below the point of inoculation on the stem, indicating that the virus travels first downwards and then upwards. Similar symptoms were observed on *Philodendron corsinianum* and *Zantedeschia africana*, the incubation periods in these two hosts being 41 and 42 days, respectively. The leaves of *Datura stramonium* inoculated with the *Anthurium* virus developed, after 26 days, angular, yellowish spots, scattered at random over the surface. It is evident from these results that the three above-mentioned pathological conditions are only different manifestations of an identical disease, which is considered to be due to a filterable virus.

A preliminary cytological examination showed the general modifications incidental to virus diseases [cf. *R.A.M.*, ix, p. 50], while the foliar parenchyma further contained foreign inclusions which appear to be products of the degeneration of the normal cellular elements [ibid., viii, p. 611].

MARCHIONATTO (J. B.). **Una micocecidia nueva para la Argentina.** [A mycocecidium new to the Argentine.]—*Bol. Min. Agric. Nac.*, Buenos Aires, xxviii, 4, pp. 469–474, 1 pl., 3 figs., 1929.

In July, 1929, the writer examined some branches of cultivated *Rhododendron indicum*, the leaves of which were deformed, swollen,

and covered with a copious white efflorescence of *Exobasidium vaccinii* (of which it is stated Burt considers *E. azaleae, E. discoideum,* and *E. rhododendri* to be synonyms) [*R.A.M.*, iii, p. 259 ; iv, p. 672 ; v, p. 649 ; vii, p. 641 ; viii, p. 649]. Some of the buds at the tips of the branches were also attacked. The affected organs lost their green colour and turned white or, in places, reddish, and assumed a fleshy consistency, eventually developing the above-mentioned farinaceous coating.

The epidermal tissues of the diseased parts are hypertrophied, and the mesophyll consists entirely of roundish cells, all distinction between palisade and spongy parenchyma being lost. The mycelium of the fungus extends throughout the leaf, occurring most abundantly in the intercellular spaces as very slender hyphae, 0·5 to 1 μ in breadth and sending small lobate haustoria into the cells. The hyphae collect in masses under the epidermis, which is ruptured to allow the emergence of the conical or clavate, later subcylindrical basidia (25 to 30 by 4 to 5 μ), bearing at their apices four filiform sterigmata, each furnished with a fusoid, slightly curved, non-septate, hyaline basidiospore, measuring 8 to 9 by 1·5 to 2 μ. The basidiospores germinate immediately after disjunction, forming hyaline, acicular, continuous secondary spores or conidia, 6 to 7 by 0·5 μ in diameter.

The conidia developed poorly on most of the solid media tested, but satisfactory growth occurred on potato agar (P_H 6·9) at 22° C. The colonies attain their maximum diameter between the 28th and 30th day, by which time the substratum has acquired a cinnamon tinge. In Petri dishes the old cultures are moriform, waxy, nut-brown, well-defined, and partially covered with a grey efflorescence ; in tubes they are elongated, with rugose centres, chestnut-coloured, with a lobulate, whitish periphery, recalling the mesenteric forms of *Sphacelia segetum* [the conidial stage of *Claviceps purpurea*: cf. ibid., viii, p. 560]. In pure culture very slender, hyaline conidiophores, 0·5 μ in breadth, and with simple or bifurcate apices are formed, and bear, laterally, conidia of the same size and shape as the secondary spores arising directly from the basidiospores.

The fungus penetrates the host during the opening of the buds or through the young leaves, its entry being facilitated by chewing insects. The presence of aphids, the body and buccal cavity of which contained the conidia of the fungus, in the diseased specimens, supports the theory of their participation in the spread of infection. The actual damage caused by the fungus is negligible, but since the blemishes are disfiguring, the application of 1 per per cent. Bordeaux mixture before and after flowering, a dormant treatment of the trunks and branches with 15 per cent. milk of lime, and the use of a standard insecticide, are recommended.

White (R. P.). **Pathogenicity of Pestalotia spp. on Rhododendron.**—*Phytopath.*, xx, 1, pp. 85–91, 2 figs., 1930.

Guba has shown [*R.A.M.*, viii, p. 605] that *Pestalozzia macrotricha* [ibid., ix, p. 318] and *P. rhododendri,* common fungi on rhododendron, have been erroneously referred to *P. guepini* [ibid., iii, p. 720]. Inoculation experiments with these organisms on the

roots or old stems of various species of *Rhododendron* (*R. ponticum*, *R. californicum*, and *R. catawbiense* hybrids) failed. The mycelium of *P. macrotricha*, inserted directly into wounds on young stems, produced typical infection, but where spores alone were used as inoculum, the results were variable. On the leaves infection was obtained only through abrasions, scalded areas, and pin pricks. Once established in these tissues the fungi spread to the healthy parts of the leaf.

White (R. P.). **Two Phytophthora diseases of Rhododendron.** —Abs. in *Phytopath.*, xx, 1, p. 131, 1930.

Phytophthora cinnamomi [*R.A.M.*, ix, p. 291] has been identified as the causal organism of rhododendron wilt, which chiefly affects *Rhododendron ponticum* and hybrid seedlings, while *R. carolineanum* and *R. californicum* are also susceptible. The fungus, a soil saprophyte, produces a decay of the fibrous roots and advances up the stem in the phloem and cambium regions. Dark brown cankers are formed on the new growth where the pathogen also invades the cortex, pith, and meristematic elements. Infection may also occur at soil level through cracks developing during the second year's growth.

P. cactorum [loc. cit.] causes a serious die-back of native and hybrid rhododendrons of all ages. Infection has been secured by inoculations through the terminal bud and bud scales on the new growth, but not in tissue upwards of one year old. This organism also causes a leaf and twig blight of lilac (*Syringa vulgaris*), and successful cross-inoculations between these two hosts were carried out.

Korsmo (E.). **Unkräuter im Ackerbau der Neuzeit. Biologische und praktische Untersuchungen.** [Weeds in present-day agriculture. Biological and practical investigations.]—ix + 580 pp., 461 figs. (1 col.), 9 diags., 8 graphs, J. Springer, Berlin, 1930.

This comprehensive study [translated from the author's Norwegian MSS. by H. W. Wollenweber] of the biology, ecology, and control of 209 weeds of common occurrence in Central and Northern Europe and North America (with special reference to Norwegian conditions) contains a section (pp. 21–29) on their part in the promotion of fungus and insect attacks. The observations relating to fungi are illustrated by some well-known examples of weeds as alternative hosts of parasites of economic plants. Some particulars are given concerning the application of various seed treatments against fungous infection, the construction of the Dinesen hot water apparatus for the control of loose and covered smut of barley (*Ustilago nuda* and *U. hordei*), loose smut of wheat (*U. tritici*), etc., being explained by means of a diagram [*R.A.M.*, vi, p. 152].

Davis (W. H.). **Two physiologic forms of Ustilago striaeformis (Westd.) Niessl.**—*Phytopath.*, xx, 1, pp. 65–74, 1930.

In view of the fact that *Ustilago striaeformis* [*R.A.M.*, v, p. 367] occurs in the rhizomes, culms, leaves, and floral organs of 40

species of grasses besides timothy [*Phleum pratense*] in Europe, America, and Australia, it is suggested that the name 'striped smut of grasses' should be substituted for the common name 'leaf smut of timothy'.

Timothy and redtop [*Agrostis palustris*] seedlings from Iowa, Wisconsin, New York, Massachusetts, Connecticut, and New Hampshire were inoculated with smut spores of *U. striaeformis* collected in various parts of the above-mentioned States (except the last-named) from each of these hosts.

The results of the experiments [which are tabulated] showed that spores from timothy seldom or never infect redtop but can attack timothy seedlings, and vice versa. Thus there are at least two physiological forms of *U. striaeformis*, one parasitic on timothy and the other on redtop. The spores of the redtop form may sometimes be distinguished by their deep chocolate colour, but no definite morphological basis could be found for the differentiation of the two physiological forms. None of the agricultural strains of timothy inoculated with *U. striaeformis* showed immunity from the timothy form of the fungus. There was no evidence of the occurrence of strains within the physiological form of the smut on timothy.

Dahl (A. S.). **Snow mold on turf grasses.**—Abs. in *Phytopath.*, xx, 1, p. 131, 1930.

Snow mould, caused by *Fusarium* spp., is prevalent on lawns and golf courses in the northern United States and Canada [see above, p. 363], the most conspicuous damage occurring on putting greens, which develop greyish patches with a pinkish tinge, usually under 12 inches in diameter, but sometimes converging to cover larger areas. Under moist or snowy conditions, when the temperature approaches freezing point, the diseased patches are covered by a mycelial weft. The fungi grow beneath the snow, so that the injury is most apparent just after it melts. The disease is favoured by heavy fertilization and covering the greens with straw late in the season. Rye, wheat, barley, oats, fescue [*Festuca* spp.], creeping bent [*Agrostis stolonifera*], and Kentucky blue grass [*Poa pratensis*] have been infected in the greenhouse. A marked difference in susceptibility has been found among the various strains of creeping bent used on putting greens. The disease has been successfully controlled by mercurous and mercuric chloride [*R.A.M.*, vi, p. 489].

Mitter (J. H.) & Tandon (R. N.). **A cultural study of two fungi found in an Indian hill Apple.**—*Journ. Indian Bot. Soc.*, viii, 3, pp. 212–218, 1 pl., 1 diag., 2 graphs, 1929.

A fungus mycelium found in the soft rot of a hill apple examined at Allahabad in November, 1927, was isolated, and four healthy apples of the same type were inoculated by placing portions of a culture in a cavity, 1 cm. in depth, made by a sterile cork borer, after which the apples were plugged, lightly rubbed over the whole surface with cotton wool dipped in absolute alcohol, wrapped in sterile grease-proof paper, and kept at room temperature for 22 days. At the end of this time all the apples showed infection near the

plug, the rotten tissues containing hyaline, ferruginous, or purplish hyphae of varying thickness, and intercalary or less frequently terminal chlamydospores.

Subsequent study indicated that two distinct fungi were involved. A seven-day-old colony of one (A) measured 3 by 2·8 cm. in diameter and varied in colour from dull white, buff, or greyish-green to greyish- or slate-blue; the mycelium was closely and regularly septate, thick, and subhyaline. No spores were formed by this fungus and, therefore, it could not be identified. The colony of the other form (B) at the same age measured 5·4 by 5·3 cm. in diameter. It begins as a loose, white mycelium which gradually turns green and later slate-blue. The mycelium is irregularly septate, with intercalary, concatenate chlamydospores; after three to four weeks dark brown pycnidia, containing dark olive-brown unicellular conidia of uniform size, developed in the substratum. This organism was referred to A. S. Horne in London, who found it to resemble *Sphaeropsis malorum* [*Physalospora cydoniae*], though an exact determination was not made. Two further inoculation experiments demonstrated the high degree of pathogenicity exhibited by B as compared with A. This is believed to be the first record of *P. cydoniae* in India, and in view of its potential importance a more detailed study of the disease under local conditions in Kashmir, Kulu, Simla, and other places where apples are grown is considered to be desirable.

Bliss (D. E.). **The occurrence of Gymnosporangium globosum on Pyrus malus in Iowa.**—Abs. in *Phytopath.*, xx, 1, p. 123, 1930.

Gymnosporangium globosum is stated to be of common occurrence in Iowa on *Juniperus virginiana* and *Crataegus* spp., sometimes accompanying the common cedar-apple rust, *G. juniperi-virginianae*, on the former host [*R.A.M.*, viii, p. 795]. The inoculation of first-year budded apple trees with sporidia from galls of *G. globosum* bearing teleutosori resulted in the development, after 13 to 19 days, of characteristic flecks on the Baldwin, Tolman Sweet, and Northwestern Greening varieties, while Wealthy, Early Harvest, Ben Davis, and Benoni failed to contract infection. No pycnidia or aecidia were formed on the flecks. During the past two years apples have not been found to serve as an alternate host of *G. globosum* in Iowa.

Arnaud (G.) & Barthelet (J.). **Le mildiou des Poires en France (Phytophthora sp.).** [Mildew of Pears in France (*Phytophthora* sp.).]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 9–10, pp. 303–308, 1 pl., 1 fig., 1929.

A brief description is given of an outbreak in the autumn of 1929 at Montreuil-sous-Bois (Seine) of a pear fruit rot caused by a species of *Phytophthora* of the *P. cactorum* type [*R.A.M.*, iv, p. 615; ix, p. 136]. No oogonia or oospores were found in the tissues of the lesions on the fruits. The disease attacked chiefly the variety Passe-Crassane, but was also observed on the Charles Ernest and Beurre Diel varieties; it is thought probable that

others may also have been affected, but the lateness of the season (the disease was not observed until October) did not allow of further observations. The outbreak was strictly localized to the neighbourhood of Montreuil, where in some cases 80 per cent. of the very large number of fallen pears were affected, and is believed to have been due to special weather conditions which favoured the development of the parasite. The disease, which causes a brown circular rot, darker than that due to *Monilia*, and eventually spreading in an irregular fashion throughout the fruit, is not considered to be of sufficient economic importance in France to warrant special control measures, but should it extend, it may be checked by spring and summer sprayings with Bordeaux or Burgundy mixture, and some degree of protection might also be attained by a winter treatment of the trees with the mixture.

Stout (G. L.). **A mosaic type in certain cases of Peach yellows occurring near Potatoes.**—Abs. in *Phytopath.*, xx, 1, p. 126, 1930.

Peach trees affected by yellows in Illinois, where the disease has been observed since 1927, after a long period of supposed non-occurrence, showed unusual foliage symptoms. The leaves were yellowish-green to extremely pale or blanched, except for the veins, which presented a marked colour contrast to the rest of the leaf surface, resulting in a mosaic-like appearance. The trees affected in this manner had a previous history of proximity to potatoes and garden plantings [*R.A.M.*, viii, p. 111], and it is thought that possibly more than one virus may cause peach yellows, the secondary symptoms varying with the agent concerned.

Smith (M. A.). **Sulphur dust for the control of brown rot of Peaches in storage.**—Abs. in *Phytopath.*, xx, 1, pp. 122–123, 1930.

Experiments to determine the fungicidal value of Koppers dusting sulphur [*R.A.M.*, ix, p. 326] were conducted at Urbana, Illinois, during 1928–9. Ripe selected Elberta peaches were divided into four lots, of which the first was brushed to remove the fuzz and then given a uniform coating of dusting sulphur; the second brushed but not dusted; the third neither brushed nor dusted; and the fourth dusted with sulphur without previous brushing. After inoculation with fresh spores of *Sclerotinia fructicola* [*S. americana*: ibid., ix, p. 43], the fruit was placed in controlled-temperature chambers ranging from 40° to 85° F. and the amount of rot noted at the end of 12 days. The sulphur was found to be effective in the control of brown rot in the brushed and unbrushed lots of peaches at 40°, 45°, and 55°, but no control was obtained in any of the lots at or above 65°. Brushed and unbrushed fruit which were inoculated but not treated rotted quickly in all the temperatures maintained.

Bliss (D. E.). **Control of yellow-leaf disease of Cherries.**—Abs. in *Phytopath.*, xx, 1, p. 123, 1930.

The normal development of cherry trees is liable to severe

retardation in Iowa as a result of the yellow-leaf disease (*Coccomyces hiemalis*) [*R.A.M.*, ix, p. 113]. Thirteen fungicides were tested for their efficacy in the control of the fungus on English Morello cherries during 1929, when twelve applications were given between 25th May and 14th August. The best results were obtained with 4–4–50 Bordeaux mixture plus 1 lb. kayso, which increased the height and diameter of 121 treated trees by 11·77 and 3·12/16 inches, respectively, over 105 controls. Bordeaux mixture alone and Koppers thylox dust [ibid., ix, p. 326] came next in efficiency, while the remaining preparations [which are enumerated] were unsatisfactory.

Rosenthal (H.). **Viruskrankheit bei schwarzen Johannisbeeren.** [Virus disease of Black Currants.]—*Obst- und Gemüsebau*, lxxv, 1, p. 14, 2 figs., 1930.

A brief note is given on the occurrence of the reversion disease of black currants in Holland [*R.A.M.*, ix, p. 44], where dormant applications of 10 per cent. carbolineum and summer treatments with a standard insecticide to destroy the insect vectors are recommended as control measures. The same disease is thought to be probably responsible for the frequent sterility of black currants in Germany.

Plantz (P.). **Winterbekämpfung des amerikanischen Stachelbeermeltaues.** [Winter control of American Gooseberry mildew.]—*Gartenflora*, lxxix, 1, p. 27, 1930.

Towards the end of the winter the shoots of gooseberry bushes infected by *Sphaerotheca mors-uvae* should be cut back at least a finger's length into the healthy wood [*R.A.M.*, viii, p. 389], and the whole planting sprayed with 3 to 5 per cent. solbar. The spraying must be concluded before the swelling of the buds in order to avoid all risk of burning. During the winter months the soil surrounding the bushes should receive liberal applications of potash and phosphorus, while an abundance of lime is also desirable at this period. Nitrogenous manures should not be used where there is any liability to mildew. A further prophylactic application of solbar (0·5 per cent.) may be given in the summer.

Rankin (W. H.). **Probable identity of red and mild mosaic of Black Raspberries.**—Abs. in *Phytopath.*, xx, 1, pp. 125–126, 1930.

The outcome of three seasons' observations on virus diseases in a black raspberry [*Rubus occidentalis*] planting indicate that mild mosaic is an expression of red mosaic and not a distinct disease [*R.A.M.*, viii, p. 731]. In the Plum Farmer variety the latter condition is definitely shown in a large percentage of cases by the black tips of the sucker laterals, while in many other individuals slightly darkened areas on the petiole of a single leaf are the only symptoms. Between these two extremes there are a number of transitional grades. Mild mosaic on the foliage of the fruiting laterals was definitely correlated in 80 per cent. of the cases with red mosaic; only 5 per cent. showing mild mosaic did not show the red form. The Plum Farmer population comprised 2 per cent. mild

mosaic alone and 46 per cent. red and mild combined. In a few cases Cumberland showed symptoms of red mosaic approaching the dark tip effect, but more often the only symptoms were tip rosette and occasional darkened areas on the petioles of a few leaves. Mild mosaic on the fruiting laterals of Cumberland was present in 91 per cent. of the plants showing red mosaic, but 67 per cent. of the plants showed mild mosaic only.

Banfield (W. M.). **Cane gall of Black Raspberry.**—Abs. in *Phytopath.*, xx, 1, pp. 123–124, 1930.

Bacteria isolated from the minute, spherical galls or elongated ridges of white granular gall tissue on black raspberry [*Rubus occidentalis*] canes in Ohio, Michigan, Oregon, and elsewhere, were found to differ consistently from the type strain of *Phytomonas* [*Bacterium*] *tumefaciens* originally isolated from apple [*R.A.M.*, viii, p. 728]. Whereas the latter induced large crown galls on tomato stems, the cane gall organism only caused the formation of slight swellings. Similarly, on red raspberry [*R. idaeus*] roots the type strain induced large galls, and the black raspberry gall strain inconspicuous swellings. On black raspberry first-year canes the strain from the same host caused the development of large swellings, while the original apple strain only induced small ones. Preliminary bacteriological studies indicate that the raspberry cane gall is distinct from the crown gall type strain, possibly a variety of *Bact. tumefaciens* or even a separate species.

Plakidas (A. G.). **Pythium root rot of Strawberries in Louisiana.**—Abs. in *Phytopath.*, xx, 1, pp. 121–122, 1930.

During 1928 runner strawberry plants were rooted in greenhouse cans containing soil inoculated with a mixture of nine different strains of *Pythium* isolated from strawberries affected by root rot in Louisiana. The potted plants contracted root disease, which was manifested in two different ways. The primary roots may be severely attacked and become rotten, so that the young plants are killed in a few days; or the course of infection may be slow, in which case the plant survives and continues to grow, but remains weak, chlorotic, and stunted. Only one of the nine strains of *Pythium* used as inoculum was reisolated from the diseased plants. It produces an abundance of twisted, swollen hyphae, but no spores on any of the media tested. In a subsequent test the symptoms were more severe on plants grown in soil inoculated with a pure culture of this strain than on those in pots inoculated with a mixture of the nine.

Martin (H.). **Chemistry and certain problems of applied mycology.**—*Journ. Soc. Chem. Ind.*, xlix, 1, pp. 11T–14T, 1930.

Some general observations are made on the relations between chemistry and applied mycology, with special reference to recent developments in the preparation and application of fungicides in the light of the investigations pursued by Prof. Salmon and his colleagues at the South-Eastern Agricultural College, Wye, Kent.

Regnier (R.). **Le contrôle des produits pour la défense des cultures en Allemagne.** [The control of preparations for the protection of cultivated crops in Germany.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 9–10, pp. 276–282, 1929.

In this note the author briefly describes the organization in Germany of the official control of commercial preparations destined for the protection of cultivated crops against insect pests and diseases due to micro-organisms. He stresses the advantages presented by the German system, which affords a maximum of liberty and personal initiative to individual firms or private inventors, while ensuring a fully adequate guarantee to the buyers of the efficacy and purity of the products registered with the Plant Protection Service and recommended in its circulars and periodical publications. The present paper is the outcome of the author's recent visit to Germany, and is written in view of the projected institution in France of a similar public control service.

Birolaud (M.). **Influence de la concentration des ions cuivre sur la toxicité des solutions de sels de cuivre pour le Blé.** [Influence of the concentration of copper ions on the toxicity to Wheat of solutions of copper salts.]—*Ann. Sci. Agron.*, xlvi, 6, pp. 733–741, 8 graphs, 1929.

Details are given of an investigation carried out at the Central Agricultural Station at Versailles to determine the manner in which solutions of copper salts act on wheat seed-grain, and to ascertain whether a relation exists between the concentration of copper ions and the toxicity of the solution. Four solutions were tested, viz., copper sulphate, copper chloride, copper acetate, and copper fluosilicate, at concentrations of 10/25, 5/25, 2/25, and 1/25. The seed-grain was immersed for 30 minutes in the various solutions, exposed to the air on filter paper for 24 hours, and then germinated on sand. The germination counts were made at the end of 15 days.

The results of the tests [expressed by tables and graphs] confirmed the common observation that the immersion of wheat seed-grain in copper salt solutions reduces its germinability, the toxic effect increasing in proportion to the concentration. The toxicity of the various salts to the seed-grain was found to differ widely at identical copper concentrations; the adverse effects were most noticeable in the case of the salt with the highest degree of electrolytic dissociation, namely, copper fluosilicate, and least so in that of copper acetate, the sulphate and chloride being intermediate. The toxicity of the various salts was also found to vary at identical hydrogen-ion concentrations, but the order of toxicity was approximately as given above. The introduction into a copper salt of an alkaline salt of the same anion (sodium sulphate to the copper sulphate, potassium acetate to the copper acetate, and potassium chloride to the copper chloride) reduced the toxicity of the solution to the seed-grain. The complex solutions formed in this manner also showed a varying degree of toxicity at identical hydrogen-ion concentrations. It would seem, therefore, that the toxicity of the copper salts is influenced by their degree of ionization but does not depend exclusively on this factor.

Schwarz (G.). **Sammelreferat. Einige pflanzenschutzliche Tagesfragen aus dem Obst- und Gemüsebau, sowie dem sonstigen Gartenbau.** [General review. Some topical problems of plant protection in fruit and vegetable cultivation, as well as in other branches of horticulture.]—*Pflanzenbau*, v, 23–24, pp. 359–363; vi, 4, pp. 122–127, 1929; 8, pp. 247–252, 1930.

Concise descriptions are given of the symptoms of some prominent fungous and physiological diseases and insect pests of fruit, vegetables, and ornamental plants in the Pillnitz district [Saxony], with notes on control measures and legislation, a list of disinfection apparatus suitable for various purposes, and a survey of some useful books and papers dealing with phytopathological topics.

Strakhoff (T. D.). Материалы по службе учета вредителей с.-хоз. II. Инструкции для наблюдательных пунктов по болезням полевых, огородных и садовых культур. [Materials for the survey service of agricultural pests and diseases. II. Instructions to observatories of field and truck crop diseases.] —Pamphlet issued by *A. A. Jaczewski Mycological Laboratory*, Leningrad, 41 pp., 1 fig., undated. [?1929. Received March, 1930.]

These detailed instructions to regional and local observatories of plant diseases were issued following a resolution passed at the sixth Pan-Soviet Entomo-Phytopathological Congress in 1929 in Leningrad concerning the reorganization of the plant protection service in Russia. Henceforth each of the Republics composing the Union will be responsible for the establishment of a chain of entomological and phytopathological stations on its territory, for the purpose of recording and studying outbreaks of diseases of local interest, of devising control measures against them, and of supplying practical agriculturists with the needed information and assistance. All the local data thus collected are, however, to be centralized at the Section of Applied Entomology and Phytopathology of the A. A. Jaczewski Laboratory in Leningrad, which will also be responsible for the higher scientific direction of all the research work of the various stations.

The instructions cover the whole field of activity of the regional and local stations, and give practical advice as to the methods of making records of diseases, together with samples of forms to be filled up in the case of each disease, both for filing at the local station and for sending to the central office in Leningrad.

Samuel (G.). **Nature of disease-producing viruses.**—*Nature*, cxxv, 3141, p. 51, 1930.

Referring to J. J. Davis's definition of disease-producing viruses (*Nature*, p. 267, 17th August, 1929) as a 'hypothetical intermediate combining molecular structure, metabolism, and reproduction' termed a 'vitamol' [see next abstract], the writer concludes that, in the existing state of knowledge, the proposed terminology is inappropriate as implying an exactitude of ideas on the subject of the viruses which is unjustifiable at the present juncture.

DAVIS (J. J.). **Viruses and life.**—*Nature*, cxxv, 3149, p. 351, 1930.

Commenting on Samuel's objection to the use of the term 'vitamol' [see preceding abstract], the writer points out that, whereas the word 'virus' as commonly used connotes an entity of unknown constitution capable of passing through filters and causing specific diseases, the vitamol is envisaged as a molecular structure with attributes of life, which might be parasitic, symbiotic, or lead an independent existence. In the study of the viruses biological methods appear to have reached their limit, and the vitamol concept was offered in the hope of gaining the interest of the physicists. It is argued that function should precede structure, and that, for the evolution of structure facilitating metabolism, there must be metabolism to facilitate. The hiatus at present existing between the non-living and the living in the evolutionary theory is considered to require bridging.

KNUDSON (L.). **Seed germination and growth of Calluna vulgaris.** —*New Phytologist*, xxviii, 5, pp. 369–376, 3 pl., 1929.

The author states that in experiments made by him [details of which are given] surface-sterilized seeds of *Calluna vulgaris*, obtained from plants growing in the nursery of the Department of Floriculture of the College of Agriculture at Cornell University, germinated readily and normally in Rayner's solution in the absence of the endophytic fungus (*Phoma radicis callunae*). The seedlings produced a good growth of roots, with no evidence of a toxic condition. These results are in complete opposition to those reported by Miss Rayner [*R.A.M.*, iv, p. 428; ix, p. 196], in whose experiments no roots were produced by the *C. vulgaris* seedlings in the absence of the fungus. This discrepancy may perhaps be explained by the fact that in the author's experiments the seeds were sterilized with calcium hypochlorite, while Miss Rayner sterilized hers with mercuric chloride, which may have injured the seeds and inhibited root formation in the absence of the endophytic fungus. On the other hand, it is believed that when the fungus was added to the cultures, it may have brought about a change in reaction in the immediate neighbourhood of the seed coats, resulting in a release of mercury and its dissipation by diffusion through the culture medium, or else that the mercury may form double salts with substances produced by the fungus, thus decreasing its toxicity. In conclusion, the author considers that the results obtained by him tend to confirm the observations reported by Christoph [ibid., i, p. 129] that *C. vulgaris* seedlings may develop in pure culture without the fungus.

RAYNER (Miss M. C.). **Seedling development in Calluna vulgaris.**—*New Phytologist*, xxviii, 5, pp. 377–385, 1929.

This is a critical review of Knudson's report of the asymbiotic germination and growth of *Calluna vulgaris* [see preceding abstract], the main point raised being that the technique for seed sterilization used by him presented the same defects as that

employed by Christoph [cf. *R.A.M.*, ii, p. 326], inasmuch as it did not furnish an entirely convincing proof that the seed was adequately sterilized. Furthermore, Knudson does not appear to appreciate the true character of seedling infection with the endophyte (*Phoma radicis callunae*) at germination, which is invariable, as distinct from mycorrhiza formation, which is entirely dependent on the nature of the rooting medium, nor does he appear to have studied the further development of the seedlings when transferred to peat sterilized by repeated steaming followed by leaching with sterilized rain water. The author also disclaims the view attributed to her by Knudson, that germination of the *Calluna* seed is entirely abnormal unless the endophyte is present and infection of the seedling occurs; her opinion, based on her own work, is that the raising of *C. vulgaris* seedlings by asymbiotic methods will eventually be found to depend upon artificially providing the appropriate conditions by the addition to the rooting medium of a suitable organic substance, but that it is highly improbable that appropriate conditions ever exist in nature, apart from those produced by proximity to the specific endophyte.

Costantin (J.), Magrou (J.), Jaudel (Valérie), & Lebard (M. P.). **Influence de la culture sur les plantes à mycorhizes.** [The influence exerted by cultivation on mycorrhizal plants.]—*Ann. Sci. Nat., Bot.*, Sér. X, xi, pp. 337–341, 1929.

The examination of the roots of a number of species of alpine plants cultivated in two gardens in the Alps and in the rock-garden of the Museum of Natural History in Paris showed that they were either devoid of a mycorrhizal fungus or, when the latter was present, it was in an obvious state of degeneration. On the other hand, the roots of most of the same species (with the exception of annuals), when growing in their natural stations, contain a vigorous and active endophytic mycelium, only occasionally exhibiting a partial degeneration. This observation leads the authors to suggest that mycorrhizal endophytes are narrowly restricted to well-defined stations, since the removal of their hosts even to a short distance is sufficient to bring about their disappearance. It also might explain the difficulty frequently encountered in the cultivation and propagation of alpine plants outside their natural stations.

Guyot (A. L.). **De quelques balais de sorcière nouveaux ou peu connus.** [Notes on some new or little known witches' brooms.]—*Rev. Path. Vég. et Ent. Agric.*, xvi, 9–10, pp. 273–275, 1 pl., 1929.

In this note the author gives a very brief description of three witches' brooms which he found in 1929 in Picardy, namely, one on marjoram (*Origanum vulgare*) caused by *Puccinia rübsaameni* [*R.A.M.*, viii, p. 676], and one each on *Prunus spinosa* and *Cytisus laburnum*; the causal organisms of the two last-named brooms have not been determined.

Beauverie (J.) & Cornet (P.). **Étude de la résistance des chloroplastes et de la chlorophylle dans un cas de parasitisme (Coryneum beijerinckii).** [Study on the resistance of the chloroplasts and chlorophyll in a case of parasitism (*Coryneum beijerinckii*).]—*Comptes rendus Soc. de Biol.*, ciii, 4, pp. 251–253, 1930.

A cytological study has been made of the processes accompanying the infection of peach leaves by *Coryneum beijerinckii* [*Clasterosporium carpophilum*: *R.A.M.*, vi, p. 624]. Diseased material placed in absolute alcohol showed an unusual modification in the normal course of the dissolving out of the chlorophyll; a green zone was left at the periphery of the lesion, whereas in the healthy controls the pigment was uniformly removed. A similar phenomenon has been described by Tsen Cheng in the case of potato leaves affected by leaf roll [ibid., ix, p. 262] and verified by one of the present authors.

In diseased material fixed with osmic acid fixatives, the green zone rapidly turns very dark, while in healthy material there is no change. The discoloration was found to be due to the formation of numerous large globules of phenolic compounds, and consequent reduction of the osmic acid. In the dry brown central portion of the lesion, the plastids are destroyed and form clumps, while the remainder of the central cavity of the cells is occupied by phenolic compounds. Beyond the line of rupture (green zone), the leaf resumes its normal thickness, or slightly more, and the chloroplasts are unaltered and perfectly distinct.

Ramsey (G. B.) & Bailey (Alice A.). **Effect of ultra-violet radiation upon sporulation in Macrosporium and Fusarium.**—Abs. in *Phytopath.*, xx, 1, p. 141, 1930,

Definite stimulation of spore production occurs in cultures of *Macrosporium tomato* [*R.A.M.*, viii, p. 534] and *Fusarium cepae* [ibid., vi, p. 268] exposed to ultra-violet radiation by a quartz-mercury arc [cf. ibid., ix, p. 48]. The increased sporulation seems to be a result of stimulation rather than an indirect outcome of inhibitory action. The effects are most marked with filters having a lower limit of transmission between 2,535 and 2800 Ångstrom units. Lethal effects accompany exposure to shorter wave-lengths. Slight stimulation occurs when filters transmitting no lower than 3,120 Å. units are used, but none with those transmitting only to 3,334 Å. units. Irradiations of 15 to 30 minutes produce a great increase of sporulation, as also does lengthy exposure to intense direct sunlight through filters transmitting no lower than 3,120 Å. units. The experiments with the mercury arc, however, tend to show that the disparity between the amount of sporulation under Vitaglass (transmitting to 2,650 Å. units) and under filters transmitting as low as 3,020 to 3,120 Å. units is due not only to a variation in intensity in this region but to a difference in the total energy transmitted.

Pissareff (V. E.) & Vesselovsky (I. A.). Селекция Картофеля в Ленинградской области. [Potato selection in the Leningrad region.]—*Ann. State Inst. of Exper. Agron.*, Leningrad, vii, 3–4, pp. 290–300, 1929.

In this paper notes are given on a number of named varieties of potatoes which have been tested since 1924 at the potato selection station of Kalitino [near Leningrad] for their resistance to disease and productivity under local conditions. Among the early varieties, Vermont proved to be rather susceptible to virus diseases and late blight [*Phytophthora infestans*], Irish Cobbler was more resistant to virus diseases but not to late blight, while a relatively high degree of resistance to the latter was shown by Epicure, which also possesses good keeping qualities. Among the medium-early and medium-late varieties, Great Scot was very resistant to virus diseases, late blight, and wart disease [*Synchytrium endobioticum*], but is not a heavy cropper in the region; Parnassia was also very resistant to wart disease, but is a poor producer in the neighbourhood of Leningrad. Of the late varieties tested, Seyanetz Svitezia [Svitez Seedling] showed marked keeping qualities and good relative resistance to late blight. It is also stated that by careful selection during several years preceding the above tests the Station has succeeded in completely eliminating virus diseases from its potato seed tuber plantations.

Goss (R. W.). **Insect transmission of Potato-virus diseases.**—Abs. in *Phytopath.*, xx, 1, p. 136, 1930.

During the past four years tests have been made under controlled conditions of the capacity of various insects to transmit different virus diseases of Triumph potatoes. Transmission of both spindle tuber and unmottled curly dwarf was obtained with grasshoppers (*Melanoplus* spp.), flea-beetles (*Epitrix cucumeris* and *Systena elongata*), the tarnished plant bug (*Lygus pratensis*), and the Colorado potato beetle (*Leptinotarsa decemlineata*). Spindle tuber was also transmitted by the leaf beetle (*Disonycha triangularis*). Less than 1 per cent. of the uncaged control plants became infected with any of the virus diseases studied. A small number of tests with *M.* spp., *E. cucumeris*, and *L. pratensis* gave negative results in the transmission of rugose and mild mosaic and leaf roll. These insects were found to be carrying the virus of spindle tuber when collected.

De Groene (F.). **Verschil in toename in het percentage mozaikziekte bij Eigenheimers, verbouwd op zware klei en lichte zavelgrond.** [Difference of increase in the percentage of mosaic disease in Eigenheimers, cultivated on heavy clay and light sandy soil.]—*Tijdschr. over Plantenziekten*, xxxvi, 1, pp. 13–16, 1 diag., 1930.

A brief account is given of the writer's experiments, conducted in 1928 and 1929 in the so-called 'Wilhelmina polder' [polder = drained marsh] to determine the effect of varying types of soil (heavy clay and light sand) on the incidence of mosaic in Eigenheimer potatoes. The results of the tests, made by planting half of each of 100 large tubers in the two types of soil, securing infection

by planting two mosaic-diseased Eigenheimers at the west end of each plot, and testing five tubers from each plant in the following year, clearly pointed to the much greater amount of the disease in the second year on sand than on clay, and thus conflicted with those of Band [*R.A.M.*, vii, p. 593], who found no evidence of any differential effect of soil. Probably this discrepancy may be explained by the fact that Band's experiments were conducted with another variety (Eersteling) [Duke of York]; the Eigenheimer is known to be particularly susceptible to the action of sandy soils.

Valleau (W. D.). **The viruses concerned in rugose mosaic of Irish Cobbler Potatoes and the weed-host problem.**—Abs. in *Phytopath.*, xx, 1, p. 135, 1930.

Transfers from 'healthy' Irish Cobbler potatoes to tobacco produce a mild disease, characterized by small, necrotic rings on rubbed leaves and mild, watered-silk patterns in new leaves (J. Johnson's mottle) [*R.A.M.*, viii, p. 592]. When virulent, it produces necrotic ring-and-line patterns (J. Johnson's ring spot—distinct from tobacco ring spot). Transfers from rugose-mosaic Cobblers to tobacco produce 'spot-necrosis' (of J. Johnson and ring spot of K. M. Smith) [ibid., ix, p. 123] or predominantly vein-banding symptoms. Spot necrosis may be separated into two distinct diseases, viz., 'healthy potato' and vein-banding (Smith's insect-transmitted disease), the latter commonly found in tobacco where potatoes have been grown. Vein-banding virus from tobacco and 'healthy potato' virus mixed produce spot necrosis in tobacco and rugose mosaic in seedling potatoes, or a severe necrotic disease of potatoes if the healthy potato virus is virulent. Vein-banding, etch, and severe etch cause mild, medium, and severe rugose symptoms, respectively, in otherwise virus-free seedling potatoes, from the tubers and second and third generation plants of which the viruses may be transferred to tobacco. Cucumber viruses also cause disease in potatoes. The viruses mentioned here, and possibly others, appear to spread from potatoes to some weeds and then to tobacco grown subsequently.

Leach (J. G.). **Survival of the Potato-black-leg pathogen in the soil and some factors influencing infection.**—Abs. in *Phytopath.*, xx, 1, p. 127, 1930.

The potato blackleg pathogen [*Bacillus phytophthorus*: *R.A.M.*, ix, p. 52] has been found to survive the winter in the soil in Minnesota, being highly resistant both to low temperatures and to slow desiccation in the soil. Excessive soil moisture, by the exclusion of oxygen, tends to inhibit the formation of wound cork by the cut potato setts, while *B. phytophthorus*, a facultative anaerobe, thrives in such soils. This inhibition of cork formation, associated with soil infection, is probably responsible for a high incidence of blackleg in moist soils or during very rainy seasons.

Lutman (B. F.). **The value of scabby potatoes.**—*Vermont Agric. Exper. Stat. Bull.* 297, 16 pp., 9 graphs, 1929. [Received April, 1930.]

Recent experiments in Vermont have shown that potato tubers

affected by scab [*Actinomyces scabies*], stored in dry air in the laboratory, lost 38 per cent. in weight between the autumn and spring, compared with 30 per cent. for clean material. Scabby tubers stored in a cool cellar in shallow flats lost 25 per cent. in weight during the same period (17·5 per cent. for clean seed), the corresponding figures for tubers kept in bushel boxes being 21 and 15·5 per cent., respectively. Neither clean nor scabby tubers lose any material amount of carbon dioxide through respiration, the loss being practically all water. The ordinary paring losses on scabby tubers are nearly double those of clean ones. At the rate of $1 per bushel for clean tubers, scabby ones would be worth 82 cents (or 76 cents taking into account the increased water losses in storage during the spring). Scabby potatoes are relatively unsaleable owing to their unsightly appearance and cannot be baked to advantage, but their actual taste does not seem to be disagreeable, or even noticeably different from the normal, to most people, so that depreciation on this account is scarcely warrantable.

Since scabby tubers must be disinfected for seed purposes, their value, with clean seed at $1 per bushel, would be about 90 cents if the clean seed is not disinfected, and 94 if it is. Some details of the cost and application of various standard methods of treatment are given.

Goss (R. W.) & Werner (H. O.). **Seed Potato treatment tests for control of scab and Rhizoctonia.**—*Nebraska Agric. Exper. Stat. Res. Bull.* 44, 42 pp., 1 chart, 1929.

From 1926 to 1928 experiments in the treatment of seed potatoes against scab [*Actinomyces scabies*] and *Rhizoctonia* disease [*Corticium solani*] were conducted at three localities in Nebraska, Irish Cobbler and Triumph varieties being used in the tests against the former disease and Early Ohio in the remainder. The treatments given included hot formaldehyde, mercuric chloride, and numerous [named] commercial organic mercury preparations.

The results [which are tabulated and fully discussed] showed that hot formaldehyde gave consistently the most effective control of seed-borne scab. The formaldehyde was applied at a strength of 1 to 120, a temperature of 122° to 124° F., and an immersion period of 4 minutes, after which the tubers were covered for an hour and then allowed to dry. Mercuric chloride failed to give control, and the addition of 1·5 parts of HCl per 100 parts of mercuric chloride solution [*R.A.M.*, ix, p. 125] did not increase the effectiveness of the latter. The organic mercury treatments either as dip or dust applied to cut or uncut seed also failed to reduce consistently the amount of scab. Soil dressings of sulphur decreased the amount of scab in 1927 but not in 1928.

Severely scabbed seed tubers treated with hot formaldehyde produced more clean potatoes than did the untreated seed.

With increasingly large amounts of soil-borne infection of either disease the benefits of the control given by seed treatment became progressively less. There was no indication of reduced yields owing to scab infection.

All the treatments given against *C. solani* gave increased yields; hot formaldehyde gave the best control as judged by stem lesions

and the presence of sclerotia on the new tubers. Mercuric chloride and the organic mercury preparations were much more effective against *C. solani* than against *A. scabies*, mercuric chloride giving the best results.

In the tests against *C. solani* with the Early Ohio variety the hot formaldehyde treatment retarded emergence during two out of the three years and the benefit given was less evident when a hot, dry period prevented the plants from overcoming the handicap of delayed emergence. To eliminate this retardation seed treatment should be effected a few weeks before planting.

As much of the potato seed planted in eastern Nebraska is infected with *C. solani* and in western Nebraska with *A. scabies* the hot formaldehyde treatment is a profitable investment and is recommended for all seed potatoes in the State.

SCHULTZ (E. S.), GRATZ (L. O.), & BONDE (R.). **Effect of seed Potato treatment on yield and Rhizoctonia in north-eastern Maine from 1925 to 1928.**—*Phytopath.*, xx, 1, pp. 47–64, 1 diag., 1930.

The results [which are fully described and tabulated] of four years' experiments (1925 to 1928, inclusive) in north-eastern Maine on the effects of various treatments on productivity and the incidence of *Rhizoctonia solani* (*Corticium vagum*) [*C. solani*] in Irish Cobbler seed potatoes showed that corrosive sublimate (1 in 1,000, 1½ hours' immersion) was one of the most effective fungicides, and in two seasons gave the highest increase of yield [*R.A.M.*, viii, p. 594]. Among the organic mercury fungicides, 76 bel dip (1 in 40), used only in 1928, was as effective against *C. solani* and in increasing the yield as corrosive sublimate. Dipdust (1 in 20) and semesan bel (1 in 10), each used in two seasons, increased the yield but did not control *C. solani* as well as corrosive sublimate or formaldehyde. Improved semesan bel (1 in 20), used in 1928 only, was apparently less efficacious than the ordinary preparation at 1 in 10. Seed treatment was most effective on seed tubers attacked by *C. solani*, though beneficial results were also given in some cases by the treatment of apparently healthy material. The yield was increased most by the control of *C. solani* in 1928 and by that of seed-piece decay [loc. cit.] in 1927.

COSTANTIN (J.). **Biologie culturale et pathologique de l' 'Hevea brasiliensis' en Indo-Chine.** [Cultural and pathological biology of *Hevea brasiliensis* in Indo-China.]—*Ann. Sci. Nat., Bot.*, Sér. X, xi, pp. i–xiv, 1929.

After a brief historical outline of the introduction and development of the cultivation of rubber (*Hevea brasiliensis*) in French Indo-China, the author gives notes on, and popular descriptions of, the chief fungal diseases that are known to occur on this crop in the principal rubber-growing countries. So far but little work has been done in Indo-China to elucidate the pathological conditions found in the rubber plantations, since it is generally considered that the climate is not favourable for a dangerous development of fungal parasites, but the sustained extension of the plantations in

recent years demands careful supervision in this respect. The diseases apparently recorded up to date include stripe canker, which is stated to be caused by a species of *Phytophthora* [see next abstract]; mouldy rot of the tapping surface caused by a species of *Sphaeronema* [*Ceratostomella fimbriata*]; a bark rot (also termed patch canker) caused by *P. faberi* [*P. palmivora*]; die-back of branches (*Botryodiplodia theobromicola*) [*B. theobromae*; *R.A.M.*, ix, p. 344]; pink disease (*Corticium salmonicolor*) [ibid., vi, p. 750]; root diseases caused by *Fomes lignosus, F. lamaoensis, F. pseudoferreus, Ustulina zonata, Xylaria thwaitesii*, and *Sphaerostilbe repens* [ibid., ix, p. 127]; and mildew (*Oidium heveae*) [ibid., ix, p. 336]. Control measures are also briefly discussed in the case of most of the diseases.

Beeley (F.). **Fungi and diseases of the tapping panel.**—*Quart. Journ. Rubber Res. Inst. Malaya*, i, 4, pp. 250–272, 6 pl., 6 figs., 1929.

Notes are given in popular terms on the symptoms, causes, and control of various diseases affecting the tapping panel of *Hevea* rubber in Malaya, including claret-coloured patch canker associated with *Phytophthora palmivora*, another *Phytophthora* closely allied to *P. meadii*, and a *Pythium* [*R.A.M.*, viii, p. 674]; black stripe disease (*P. palmivora*, *P. meadii*, and *P. heveae*) [loc. cit.]; mouldy rot (*Sphaeronema fimbriatum*) [*Ceratostomella fimbriata*], with which may be associated a *Fusarium* of the *Martiella* group and species of *Diplodia, Penicillium, Aspergillus, Actinomyces*, and other organisms; sun scorch and die-back of physiological origin, but associated with *Botryodiplodia theobromae, Helminthosporium heveae*, a *Cladosporium, Pestalozzia palmarum*, a *Penicillium*, and a *Graphium*; and white fan blight. The last-named [ibid., v, p. 633], caused by a weakly parasitic species of *Collybia*, is occasionally found in very wet districts. A white, silky mycelium spreads fan-wise over the surface of the tapped portion of the panel, apparently superficial though closely adpressed to the surface. Distinct venation is noticeable, due to the presence of thick vein-like strands of hyphae, and if the fungus is removed the impress of these strands is found to have grooved the outer layers of the cortex; growth usually begins at the corners of the extremities of the tapped panel.

Bally (W.). **Eenige opmerkingen omtrent bladafval door Phytophthora bij Hevea.** [Some observations concerning leaf fall of *Hevea* caused by *Phytophthora*.]—*De Bergcultures*, iv, 3, pp. 56–57, 3 figs., 1930.

During the rainy season of 1929, *Phytophthora* leaf fall of *Hevea* rubber [*R.A.M.*, viii, p. 333], hitherto little in evidence in Java, occurred in a severe fashion in the Semeru district. The photographs accompanying this article, which show the upper parts of the trees almost stripped of leaves, are believed to be the first representing the disease in Java. A *Phytophthora* was isolated from infected leaves, but in the absence of sporangia it was impossible to determine the species. A certain amount of rotting of the fruit

was also observed. The area concerned is one of the wettest in Java, with a rainfall of 5,000 to 6,000 mm. per annum.

ABBOTT (E. V.). **A new host of Sugar-Cane mosaic.**— *Phytopath.*, xx, 1, p. 109, 1930.

While inspecting sugar-cane fields for mosaic near Lima, Peru, during 1929 [*R.A.M.*, viii, p. 668], the writer observed several cases of infection on *Gynerium sagittatum* [*G. saccharoides*] growing on the borders of fields infested by the disease. Both mature plants and young shoots of the wild host may be attacked. The symptoms of the disease on the wild and cultivated hosts are identical. *G. saccharoides* is of widespread occurrence on the banks of irrigating ditches in Peru.

LEE (H. A.). **Estimating damage by mosaic.**—*Ann. Rept. Seventh Convention Philipp. Sugar Assoc., 1929.* [Abs. in *Facts about Sugar*, xxv, 13, pp. 312–313, 1930.]

Using a method developed by Roxas, whereby 100 stools of mosaic cane and 100 healthy are selected for comparative analysis from a uniform commercial planting of the variety to be studied, the losses in sugar yield due to the disease were found to be as follows: Mauritius 1900, 69·34 per cent.; Luzon white, 62·05; Pampanga Red, 55·72; Barbados 147, 64·61; Cebu Purple, 43·65; Hawaii 109, 49·35; and New Guinea 24-A, 21·46.

BOLLE (P[IERRETTE] C.). **De roodestrepenziekte.** [The red stripe disease.]—*Arch. Suikerind. Nederl.-Indië*, Deel iii, xxxvii, pp. 1147–1218, 5 pl. (1 col.), 1929. [English summary.]

The red stripe disease of sugar-cane was first detected in Java in 1927 [*R.A.M.*, viii, p. 265] but appears from museum specimens to have been present since at least 1915. It has now been definitely proved by a comparison of the symptoms, microscopic characters, cultural studies, and inoculation experiments [the results of which are fully described and tabulated] to be due to *Phytomonas rubrilineans*, the same organism which is responsible for the similar disease in Hawaii. Slight differences were found between the Java and Hawaiian strains, the index number of the former, according to the chart of the Society of American Bacteriologists, being 5321–32120–1333, as against 5322–32120–1233 given for the latter, but these are not regarded as of specific rank. The typical symptoms of red stripe were readily produced by pouring an aqueous suspension of the bacterium between the bases of the partially unfurled leaves, this method being more effective than inoculation near the top. Young, rapidly growing tissues were found to be most susceptible to infection by *P. rubrilineans*, and under natural conditions in Java the red stripe disease is mainly prevalent on two- to six-months old canes during the west monsoon. Infection is usually restricted to the tops of the first developed leaves and does not assume the severe character common in Hawaii. The disease has been observed not only in nursery and commercial cane, but also in the so-called 'rajoengans' (side shoots developing on canes specially topped for this purpose, the parts of the canes bearing these shoots being then used for planting), in which

infection often extended into the leaf spindle and growing point, causing a top rot of the lateral shoots.

Observations and comparative inoculation tests have shown that, under normal conditions in Java, red stripe disease is not very virulent on the P.O.J. 2878 and 2883 varieties, the latter especially being highly resistant. The P.O.J. 2947 variety, however, is very susceptible to red stripe, 50 per cent. of the stalks sometimes contracting a particularly severe form of infection which is liable to develop into top rot. A special method of testing new varieties for susceptibility and sensitiveness to red stripe has been devised and is fully explained.

Inoculations on cut setts showed that infection may occur through the cut surface and may prevent the development of roots or shoots. The use of a contaminated knife for cutting seed pieces or topping stalks may, therefore, check or prevent the growth of the buds. In the event of shoot formation, however, no symptoms of disease appear on the leaves but their growth is very slow. Soil infection may inhibit the germination of the cuttings, but does not appear to affect 'rajoengans'. Even withered diseased leaves may constitute a source of infection for knives, cuttings, and soil, pot experiments having shown that absolutely dry leaves, infected by *P. rubrilineans* four months or more earlier, prevented germination when placed beside cuttings in the soil. The virulence of the causal organism in such leaves was further demonstrated by the injection of an extract from them into the leaf spindles of healthy plants.

It was shown by water culture experiments that *P. rubrilineans* cannot penetrate the stem through unwounded roots, whereas entrance was easily effected through the cut ends of the shoots and stalks. This mode of infection on cane stalks placed with the cut end in a bacterial suspension greatly impeded the development of the side shoots when the stalks were topped. The prevention of lateral growth occurred in a reverse direction to that observed when infection took place on the upper surface of stalks topped in the field for the development of 'rajoengans', as the lower buds were those that were chiefly inhibited, the activity of the bacterium being most marked near its point of entrance. On the control stalks in pure water, both the upper and lower buds sprouted.

A red discoloration was always found in the larger vascular bundles of seed pieces and stalks infected by way of the cut ends. The bacteria developed chiefly in the xylem and phloem of the affected bundles, and very often also in the surrounding tissues. The red vascular bundles could often be traced from the point of entrance of the organism through several nodes and internodes. It was further demonstrated that the retardation of germination in infected setts was due to the activity of the living organism, since neither this phenomenon nor reddening of the vascular bundles occurred as a result of inoculation with a bacterial extract or with the metabolic growth products of *P. rubrilineans*.

No control measures against red stripe seem to be necessary in the case of the P.O.J. 2878 and 2883 varieties, which recover spontaneously with advancing age. With susceptible varieties, however, such as P.O.J. 2947, it is advisable to remove and

disinfect the diseased leaves, while the singeing of the infected parts on the plant may also be recommended. In seed-cane fields all diseased material should be removed before cutting or topping operations are begun, care being taken to dispose of all withered leaves if red stripe has already occurred in the previous planting. Attempts to disinfect cuttings that had already contracted red stripe were unsuccessful.

CABALLERO (A.). **Algunas novedades botánicas de la Real Casa de Campo y de El Pardo.** [Some new botanical discoveries from the Real Casa de Campo and El Pardo.]—*Mem. R. Soc. Española Hist. Nat.*, xv, 1, pp. 309–314, 1929.

Notes are given on some fungi of interest occurring in two localities near Madrid. *Coniothyrium olivaceum* var. *aceris* Ferr. was found (first record for Spain) on the leaves of *Acer pseudoplatanus* in association with *Microdiplodia microsporella* Sacc. var. *foliorum* n. var. *Gloeosporium subcuticulare* n. sp., characterized by punctiform, grey or pale, erumpent acervuli, up to 150 μ in diameter, and subhyaline, cylindrical, oblong, or ellipsoid conidia, 5 by 1·3 μ, forms scattered or confluent, black spots on living leaves of *Salix fragilis*. *Uncinula aceris*, new to Spain, was found on the leaves of *A. campestre*. *U. salicis* occurred in profusion on the leaves of *Populus nigra* (second record for Spain), the same host being also frequently parasitized by *Taphrina aurea* [*R.A.M.*, vi, p. 586].

UNAMUNO (L. M.). **Nuevos datos para el estudio de la flora micológica de los alrededores de Llanes (Asturias).** [New data for the study of the mycological flora of the environs of Llanes (Asturias).]—*Mem. R. Soc. Española Hist. Nat.*, xv, 1, pp. 345–354, 4 figs., 1929.

Thirty-six species of fungi occurring in the vicinity of Llanes (Asturias) are enumerated, of which nine are new to science and fourteen to the Spanish flora. *Sphaerella cynodontis* n. sp., found on dry leaves of *Cynodon dactylon*, is characterized by black, punctiform perithecia, 38·5 by 42·5 μ, with circular ostioles 6 to 8 μ in diameter, and oblong-clavate asci, 20 to 28 by 10 μ, containing eight hyaline, uniseptate, oblong ascospores measuring 10 to 12·5 by 3 to 3·5 μ.

Leptosphaeria colocasiae n. sp., occurring on large, yellowish-brown, later whitish spots with reddish-violet borders on living leaves of *Colocasia antiquorum*, is characterized by amphigenous, globose, subglobose, or piriform, brownish-black perithecia, 88·5 by 140 μ, with subpapillate ostioles, 17·5 to 30 μ; cylindrical asci, slightly tapering at the base, 51·5 to 70 by 10·5 to 12 μ, furnished with filiform paraphyses of equal length; and oblong, distichous, straight or curved, dark olivaceous, tri-septate ascospores, 7·5 to 19 by 3·5 to 7 μ.

Phoma maelena (Fr.) Mont. et Dur., new to Spain, was found on shoots of *Medicago lupulina*. *P. phaseolina* Pass., also new to the Spanish flora, was found on the pods of bean (*Phaseolus vulgaris*). The same host was infected by *Placosphaeria phaseoli* n. sp.,

characterized by amphigenous pycnidia, 145 to 210 by 90 to 98 μ, and hyaline, ovate or oblong spores, 5 to 7 by 3·5 to 4 μ.

Monilia [*Sclerotinia*] *fructigena* was observed on plums (*Prunus domestica*), a new host for Spain.

MAYOR (E.). **Notes mycologiques—vii.** [Mycological notes—vii.] —*Bull. Soc. Neuchâtel. Sci. Nat.*, liv (N.S., iii), pp. 45–59, 1929. [Received March, 1930.]

Notes are given on some fifty species of Peronosporaceae, Erysiphaceae, Uredineae, and Ustilagineae, which were observed or collected by the author from 1927 to 1929, in the Neuchâtel Canton. The following items are of special interest. In one locality on the shore of the lake of Neuchâtel the leaves of osier willows (*Salix viminalis*) were found to be heavily infected by, and to bear numerous perithecia of *Podosphaera schlechtendalii*, a fungus which was described by Léveillé from the neighbourhood of Paris in 1851, but does not appear to have been again found. Besides the rarity of its occurrence, the fungus does not produce any visible alterations or discolorations of the leaves attacked by it; its mycelium is not discernible among the white down covering the under surface of the leaves, and its perithecia can only be seen with the help of a lens, thus in a great measure explaining why it has been so seldom observed. Careful search failed to reveal it outside the locality mentioned, where a few perithecia were also found on the leaves of five other species of willow, but are thought to have accidentally fallen on them, since observations indicate that *S. viminalis* alone is susceptible to *P. schlechtendalii*.

Although *Microsphaera alphitoides* [*M. quercina*] is very common on oak in its conidial stage, its perithecia were never found in the Canton until 1928, when they occurred in large numbers on *Quercus pedunculata* and *Q. sessiliflora* over the whole region [cf. *R.A.M.*, viii, p. 411]; in 1929, however, careful search failed to reveal any perithecia, even in the places where they had been most abundant the foregoing year.

Of all the species of *Ornithogalum* which serve as alternate hosts of brown rust (*Puccinia simplex*) [*P. anomala*] of barley, *O. umbellatum* [ibid., v, p. 663] alone is fairly widespread in Neuchâtel, but no natural infections were seen on the plant, even in places where the surrounding barley fields were severely attacked. Greenhouse inoculation experiments made in March, 1928, showed, however, that the aecidial stage of the rust develops readily on this weed, the first symptoms of infection appearing 11 days after inoculation; the aecidia reached maturity some two weeks later (10th April), and continued for several days to release an abundance of spores.

Entyloma dahliae [ibid., vii, p. 765] was found in 1929 at Perreux sur Boudry attacking 36 varieties of dahlia imported from France and 10 varieties imported from Lausanne, while numerous local varieties growing at a distance of less than 50 m. from the infected plants remained strictly immune from the disease until the end of the season. This is stated to be the first record of the disease in Switzerland.

MAUBLANC (A.). **Observations sur quelques champignons du Brésil. I. Sur un parasite des feuilles de Mikania.** [Observations on some Brazilian fungi. I. On a parasite of the leaves of *Mikania*.]—*Arch. de Bot., Bull. Mens.*, ii, 7, pp. 121–129, 3 figs., 1928.

On several occasions the author noted leaves of various species of *Mikania*, especially *M. hirsutissima*, growing in the vicinity of Rio de Janeiro, which showed small, diffuse, yellow, later darker, spots; the affected tissues contained a hyaline, later dark, intercellular, septate mycelium compacted at the centre of the spots, under the upper epidermis, into a dense, black, carbonaceous, erumpent, finally superficial, rugose stroma, 0·4 to 1 mm. in diameter, with erect, brittle, black hairs up to 125 μ long by 7 to 8 μ broad. The stroma was connected with the internal mycelium by clusters of moniliform hyphae, and finally projected through the epidermis as a tubercle attached to the mycelium below by a somewhat thick central stalk. From the edge of the stroma projected globular perithecial loculi; the wall, which in the free part measured 40 to 50 μ thick, directly continued the body of the stroma, and abruptly became thinner at the top, forming a short neck with periphyses, opening at maturity into a round ostiole. The asci, which were mostly clavate with a short, thick stalk, but sometimes cylindrical or ovoid, with the wall thickened at the top, measured 60 to 95 μ [from the diagnosis: given in the text as 50 to 80 μ] by 18 to 32 μ, had diffluent, filamentous paraphyses, and contained eight distichous, tristichous, or conglobate, oblong, uniseptate, constricted ascospores, the cells being approximately equal in size or the lower one slightly narrower than the upper; they were at first hyaline, but turned brown when mature, and measured 18 to 25 μ by 8 to 11 μ.

The fungus agrees with the descriptions of *Lizonia bertioides* Sacc. & Berl., *Parodiella caespitosa* Wint., *L. uleana* Sacc. & Syd., and *Maireella maculans* Syd. ap. R. Maire. As the author considers it to be analogous in structure with typical Dothideaceae he accepts the genus *Maireella* and renames the fungus *M. bertioides* (Sacc. & Berl.) n. comb.

From an examination of the type specimen of *Dothidella mikaniae* P. Henn., found by Puttemans on *Mikania* near São Paulo, the author considers that this also should be transferred to *Maireella* and renames it *M. melioloides* (Rehm) n. comb., Theissen having already shown that Henning's fungus is identical with *Gaillardiella melioloides* Rehm.

Full diagnoses are given in Latin of the genus *Maireella* and the two species concerned.

THOM (C.). **The Penicillia.**—xiii + 643 pp., 99 figs., London, Baillière, Tindall & Cox, 1930.

This important monograph of the penicillate Hyphomycetes describes 619 species which can be definitely assigned to the group and 49 species referred in the literature to the genus *Penicillium* but which should be excluded now from the group; 19 new species and 4 new varieties are described. *Gliocladium* Corda, *Scopulariopsis* Bainier, and *Paecilomyces* Bainier are retained in the

group as independent genera but *Citromyces* Wehmer is merged in *Penicillium*. A natural grouping of species in the four genera has been aimed at, founded on a close study of the morphology of the conidiophore, 'penicillus', and conidia and the growth habit on a few standard media, among which Dox's synthetic agar based on Czapek's solution has proved to be especially useful. Physiological characters such as mass colour of the conidia, colour of the 'reverse', odour, temperature relations, and reaction in milk and on gelatine are employed as a means of separating individual strains, closely related species, or series of species. The author has retained *P. expansum* Link as the type species of *Penicillium*, and the arrangement of the genus follows more or less closely that proposed by Biourge [*R.A.M.*, iii, p. 178]. The genus is broken up into the four divisions—Monoverticillata, Asymmetrica, Biverticillata-symmetrica, and Polyverticillata-symmetrica. The first-named (with two sections) covers most of Biourge's subgenus *Monoverticillium*, which includes *Citromyces*. The Asymmetrica (subdivided into six sections) includes the major portion of Biourge's section *Bulliardium* or *Asymmetrica*, while the Biverticillata-symmetrica (with four sections) corresponds in part to his section *Biverticillium*. The small fourth division with four species is based on Costantin's *Synpenicillium*, but excludes his type species *S. album*. The larger sections are divided into a number of subsections and an artificial key to the species is provided for each section.

In the last chapter there is a key to the group names and a useful key to species having conspicuous characters such as production of ascocarps, sclerotia, coremia, colour of colony, and the like.

The earlier chapters deal with the history of the group, generic concepts, collections, culture media, descriptive method, physiological activity, biochemistry, distribution in nature and in industry (including species commonly occurring on certain substrata), and species pathogenic to man and animals. An extensive bibliography, arranged alphabetically by authors, and a general and species index are provided.

Tamiya (H.) & Morita (S.). **Bibliographie von Aspergillus. 1729 bis 1928. Fortsetzungen IX und X.** [Bibliography of *Aspergillus* from 1729 to 1928. Continuations IX and X.]—*Bot. Mag.*, Tokyo, xliii, 515, pp. 577–589, 516, pp. 625–633, 1929.

The first of these papers comprises the titles of 163 papers relating to *Aspergillus* published between 1914 and 1917, while the second contains 104 titles of works appearing during the period 1918 to 1920, inclusive [*R.A.M.*, ix, p. 205].

Wiltshire (S. P.). **A Stemphylium saltant of an Alternaria.**—*Ann. of Botany*, xliii, 172, pp. 653–662, 2 pl., 4 figs., 1929.

The author states that a species of *Alternaria*, tentatively regarded as a small-spored strain of the *A. tenuis* group, which was isolated from rotting grapes received from Australia, repeatedly produced from single spores placed on Richards's medium

in Petri dishes a saltant form with the character of the genus *Stemphylium*. A detailed description is given of the saltant and of the parent *Alternaria*. All attempts to induce the reversion of the saltant to the parent type failed. The paper concludes with a brief discussion of the taxonomic significance of this case of saltation.

Nagorny (P. I.) & Kančaveli [Kantshaveli] (L. A.).—Грибы, собранные на Чайном кусте на чаквинских плантациях в **1928** году. [Fungi collected on the Tea bush on the Tschakva plantations in 1928.]—*Bull. Inst. of Exper. Agric. of Georgia., Tiflis, 1929*, 2, pp. 33–46, 1929. [German summary.]

This is a report on the fungal diseases of the tea bush which were observed during the further survey made in 1928 of the Tschakva tea plantations [*R.A.M.*, viii, p. 814]. In addition to the species described in the former paper, it contains notes on the following parasitic fungi, brief descriptions of which are given. An undetermined species of *Leptosphaeria* which, on living twigs, forms globular, at first immersed and later erumpent, perithecia with a wart-like ostiole; the asci are clavate, with a short pedicel, and measure 50 to 70 by 11 to 11·5 μ; the ascospores, eight in number, are spindle-shaped, slightly concave on the inner side, light olive-coloured, with five transverse septa, and measure 19 to 23 by 4 to 4·5 μ. Paraphyses are present. This species differs from *L. camelliae* Cooke & Massol [Massee] in its habitat and in the number of spores contained in the asci and their dimensions, and from *L. camelliae-japonici* Siemaszko in the shape of the asci, their size, the number of septa in the spores, and some other minor details. It usually occurs in association with *Mycosphaerella ikedai* K. Hara; the latter forms immersed, later erumpent, globular or applanate perithecia, 80 to 100 μ in diameter; the eight ascospores are ellipsoidal, slightly concave on the inner side, two-celled, and measure 12 to 15 by 3·5 to 5·5 μ; and the asci are 30 to 40 by 10 to 12 μ in diameter. Although Petch considers this species as a saprophyte, in the Tschakva plantations it was only found on living twigs and leaves. *M. theae* Hara was found (in association with *Pigottia theae*) on living tea leaves, on which it forms rounded or irregular, frequently coalescing, mostly marginal spots, dirty white on the upper and brown on the under side. *Phoma brunaudi* Sacc., on living and dying twigs, forms dispersed, globular, black pycnidia, 110 to 140 μ in diameter; the spores are ellipsoidal or ovoid, hyaline or faintly smoke-coloured, continuous, and measure 5 to 7 by 2·5 μ. *Macrophoma theicola* Petch [ibid., iii, p. 4; viii, p. 470] forms, on living leaves, irregular or angular, at first light chocolate and later whitish or dirty white, amphigenous spots, with a conspicuous dark margin. The pycnidia are immersed, applanate spherical, 200 to 500 μ in diameter; the spores are short spindle-shaped, of a delicate olive colour, and measure 21 to 24 by 5 to 6 μ. *Cercospora theae* [ibid., iii, p. 4; viii, p. 138] forms on living leaves rounded, white spots with an almost black margin, and measuring up to 3 mm. in diameter; the conidiophores are short and simple; the spores are long-obclavate, pluriseptate, straight or bent, light olive-coloured, and measure 70 to 85 by 2·5 to 4 μ.

The roots and rootlets of unhealthy young tea bushes, which yielded easily to a light pull, were found to bear small, gall-like excrescences; when placed in a moist chamber they developed an abundant superficial mycelium, at first white and downy and later pinkish and membranous, in places bearing accumulations of conidia resembling in shape and dimensions those of *Fusarium viticolum* [*F. viticola*: ibid., ix, p. 14]. A peculiar pathological condition was also observed in the plantations, the cause of which was not established; it is characterized by an abnormal proliferation of adventitious buds on young shoots, giving them a bushy appearance, accompanied by deformation of the leaf blades and suberization of their margins; outwardly this condition is strongly reminiscent of the witches' brooms described by Park [*R.A.M.*, iv p. 637], whose account of the disease is briefly summarized.

Duggar (B. M.). **The problem of seed transmission of the typical mosaic of Tobacco.**—*Journ. of Bact.*, xix, 1, p. 20, 1930.

In this paper (read at the thirty-first annual meeting of the Society of American Bacteriologists, held at Ames, Iowa, from 30th December, 1929, to 1st January, 1930), an account is given of experiments carried out with a variety of proteins and other complex substances which might be concerned in the adsorption of the typical tobacco mosaic virus [*R.A.M.*, vi, p. 501, ix, p. 138]. In some cases the results of these tests were positive, and a further study was therefore made of the influence of various ground seeds in the inactivation of the virus. Seeds of diverse composition were included in the investigation, i. e., those primarily starchy and those preponderantly proteinaceous, representing several different families of plants.

Inactivation of the virus was found to be marked with certain proteinaceous seeds, but this is not a factor of the absolute protein content, depending apparently on specific proteins or other specific materials accompanying them. The ground tobacco seed is likewise capable of producing inactivation, which is, however, never complete at the concentrations employed. Attention is drawn to the probability of the relation of transmission to adsorption and inactivation through storage proteins.

Hoggan (Ismé A.). **Studies on aphid transmission of plant viruses.**—*Journ. of Bact.*, xix, 1, pp. 21–22, 1930.

The capacity of aphids for transmitting the virus of ordinary tobacco mosaic has recently been questioned [cf. *R.A.M.*, viii, p. 554]. Greenhouse trials have proved that *Myzus pseudosolani* and *Macrosiphum solanifolii* [*M. gei*: ibid., ix, p. 198] are able to transmit this virus from tomato to various Solanaceous hosts, although they apparently cannot transmit the same virus from tobacco. On the other hand, they will readily transmit the cucumber mosaic virus from both tobacco and tomato, as will also another species, *Myzus circumflexus*. The last-named insect appears unable to transmit the virus of ordinary tobacco mosaic from tobacco, resembling in this respect the peach aphid (*M. persicae*) [ibid., viii, p. 518]. No adequate explanation can yet be offered to

account for this peculiar selective capacity both in respect of the virus and of the host. While, therefore, *M. pseudosolani* and *Macrosiphum gei* may be factors in the dissemination of ordinary tobacco mosaic on tomato, none of the aphids studied is likely to be of importance in the spread of the disease in tobacco fields [cf. ibid., ix, p. 207].

JOHNSON (B.) & DUGGAR (B. M.). **Stomatal infection with the virus of typical Tobacco mosaic.**—Abs. in *Phytopath.*, xx, 1, pp. 141–142, 1930.

Numerous field and greenhouse experiments were conducted to determine the conditions limiting stomatal infection in typical tobacco mosaic [see preceding abstracts]. In order to secure data on any possible correlations between the diurnal movements of the host stomata and disease production, lots of ten plants in two series were sprayed hourly with the virus by means of an atomizer throughout the day. Records of general weather conditions, temperature, and humidity were taken. At each application strips from the lower and upper epidermis were removed and placed in absolute alcohol. Subsequent investigation showed that all the stomata are never completely closed, and that the stomatal diurnal movements are not correlated with the environmental conditions within the limits of the tests. Moreover, the percentage of disease production is not correlated with these environmental changes or in any way related to the time of day at which sprayings were made. A high rate of infection (average 80 per cent.) was obtained in these tests.

MULVANIA (M.). **Root inoculation with the virus of Tobacco mosaic.**—*Journ. of Bact.*, xix, 1, pp. 23–24, 1930.

A number of experiments were conducted to determine the possibility of infecting tobacco plants with the mosaic virus applied by the following methods: (1) the uninjured roots of young plants were placed in contact with the juice of plants affected by the disease; (2) needle inoculations were made into the rootlets; and (3) the infectious juice was applied directly to the freshly cut roots. None of the plants (over 150 in all) showed any symptoms of the disease, whereas corresponding leaf inoculations resulted in 80 to 90 per cent. infection [cf. *R.A.M.*, ix p. 207]. Subsequent leaf inoculations into plants which failed to contract infection through the roots gave the usual high rate of infection common to the former method.

MES (MARGARETHA G.). **Fisiologiese siektesimptome van Tabak.** [Physiological disease symptoms of Tobacco.]—Thesis, University of Utrecht (Hollandia-Drukkerij, Baarn), 141 pp., 6 pl., 1930.

In this comprehensive study of physiological disturbances of tobacco, the writer gives a detailed account, supplemented by 18 tables, of her experiments in the production of various pathological conditions by the cultivation of seedlings in nutrient solutions of varying composition. The plants (mostly of the Brazilian variety)

were grown in a frame kept at a temperature of 20° to 39° C. in summer and 15° to 27° C. in winter, in glass vessels containing water, sand, or soil to which different concentrations of various mineral salts were added. The symptoms of deficiency and excess of calcium, phosphorus, iron, magnesium, potassium, and nitrogen are fully described [cf. *R.A.M.*, viii, p. 473], and the factors causing various diseased conditions, such as chlorosis, different types of physiological leaf spotting, top rot, and red rust [ibid., viii, p. 554], are analysed.

A 15-page bibliography is appended.

Samson (R. W.). **Relation of Jimson weed to certain viruses of Tomato and Potato.**—Abs. in *Phytopath.*, xx, 1, p. 136, 1930.

Two virus diseases of the Jimson weed [*Datura stramonium*] have been differentiated. That of the milder type closely resembles the virus (B of Fernow [*R.A.M.*, v, p. 314], mottle of Johnson) [see above, p. 402] found in healthy potatoes and is obtainable from this source. The virus of the more severe type produces more pronounced symptoms in tomato than that of the mild type, which it resembles, however, in causing streak when inoculated into mosaic tomato plants. It has been transmitted to and recovered from nine Solanaceous plants, including potato seedlings, without loss of virulence. The severe virus of Jimson weed somewhat resembles that of Johnson's spot necrosis or rugose mosaic but has not been found in uninoculated potatoes of standard varieties. Both the Jimson weed viruses survived 80 days' ageing *in vitro* in tomato juice at 10° C. When the tomato streak virus complex is passed through Jimson weed the tomato mosaic virus is not recovered. The latter produces only localized lesions in *D. stramonium*.

Doolittle (S. P.) & Blood (H. L.). **Investigations of Tomato streak.**—Abs. in *Phytopath.*, xx, 1, p. 134, 1930.

Three distinct forms of tomato streak [*R.A.M.*, viii, pp. 394, 409] have been found to exist in Wisconsin. One is the familiar form produced by the combination of tomato mosaic and potato juice [see preceding abstract], while the other two forms, of unknown origin, apparently do not contain the potato factor. The potato combination and one of the other forms produce a marked leaf necrosis and streaking of the stem, while the remaining form causes severe stem streaking with occasional inconspicuous leaf necrosis. In the expressed juice of plants affected with the potato combination the thermal death point of the virus is 65° to 70° C. and its longevity *in vitro* is about 14 days. One of the other forms has a thermal death point above 80° and lives for at least 180 days. Comparative inoculation tests on 45 species of Solanaceae showed marked differences in the symptoms induced by each of the three forms. Experiments on plants held at constant temperatures between 16° and 28° showed that the relative intensity of stem and leaf necrosis could be greatly modified, or these symptoms entirely suppressed, by changes in temperature.

McCubbin (W. A.) & Smith (F. F.). **Spread of mosaic virus in Tomato plants.**—*Journ. of Bact.*, xix, 1, p. 23, 1930.

The results of previous investigations indicated that the tomato mosaic virus spreads through the stems at the rate of 1 to 2 mm. per hour [*R.A.M.*, vii, p. 281]. Later repetitions of the work showed that at somewhat lower temperatures the passage of the virus is greatly delayed. The procedure involved rooting several branches of a tomato plant in surrounding pots so that any member of the resulting colony might be removed and grown separately; inoculation of one colony member with mosaic virus; removal of individual members thereafter at stated intervals; and subsequent observation of such members to note the presence or absence of mosaic.

When a section of the woody cylinder was removed from the stem connecting colony members the virus was apparently able to cross this point readily; when a ring of cortex was removed mosaic developed in the uninoculated shoot in several cases.

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P.C. 368.—Regulation No. 18 (Foreign).—1 p., 1930.

By a regulation effective as from 17th February, 1930, the importation into Canada of all species and varieties of wheat, including wheat straw, bran, and chaff, from Australia and Asia is prohibited unless each consignment is accompanied by a duly authenticated certificate that it was harvested in a locality free from flag smut (*Urocystis tritici*).

Phony Peach quarantine modified.—*Plant Disease Reporter*, xiii, 14, pp. 171–172, 1930.

The phony peach quarantine [*R.A.M.*, viii, p. 672] has been extended, as from 1st November, 1929, to 19 counties of Georgia and 6 of Alabama. A virtually complete survey of the commercial orchards of the counties included in the new amendment revealed only a small number of recent infections in these districts. The diseased trees are in process of eradication. In order to protect the zones of slight infection and those in which intensive eradication operations are in progress, the regulated areas are divided into two sections, known as the 'generally infected area' and 'lightly infected area', respectively. The movement of peach nursery stock and other restricted material from either area to outside points and from the generally infected to the lightly infected area is prohibited except under permit.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

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BEWLEY (W. F.) & BOLAS (B. J.). **Aucuba or yellow mosaic of the Tomato plant: reaction of infected juice.**—*Nature*, cxxv, 3143, p. 130, 1930.

A marked reaction has been found to result from mixing the expressed juice of a tomato plant affected by aucuba mosaic [*R.A.M.*, vii, p. 748; viii, p. 394] with an aqueous colloidal solution of tomato chlorophyll, i. e., the mixed green pigments extracted from fresh plant material by Willstätter's and Stoll's method. The most striking manifestation of this reaction is the development of a brown colour and the apparent destruction of a greater or lesser amount of the chlorophyll. This phenomenon is either not exhibited at all, or in a very much slighter degree, by the sap of a healthy plant.

The reaction shows a marked sensitiveness to light, being greatly accelerated by a light intensity of the order of 800 foot candles at a temperature about 30° C., thus showing a certain parallel with the development of mosaic symptoms in the living plant. The reaction was less evident in a sample of infected sap after a few seconds' boiling, and it does not appear to be directly correlated with the oxidase or peroxidase content of the sap. Under the conditions of the tests the browning has not been observed to occur to any marked extent with infected sap exposed to light in the absence of colloidal chlorophyll, although it is well known that the sap of an infected plant is either brown or becomes so on keeping. At the dilutions employed in these tests, however, this brown colour is scarcely perceptible and cannot explain the marked change on exposure to light, which is not shown by the sap in the absence of colloidal chlorophyll.

These observations suggest that the reaction in question may provide a rapid and quantitative means of studying *in vitro* the nature of the virus and its reactions, the examination of which has hitherto entailed protracted inoculation experiments.

MOGENDORFF (N.). **'Fern-leaf' of Tomato.**—*Phytopath.*, xx, 1, pp. 25–46, 5 figs., 1930.

The comparatively rare and sporadic natural occurrence of fern-leaf of tomatoes [*R.A.M.*, viii, p. 409], together with the difficulty of reproducing it experimentally, suggested the desirability of

further investigations, which were conducted at Madison, Wisconsin. Most of the plants, which were started in flats in a greenhouse at 28° to 32° C. and subsequently transplanted into compost soil in pots, were common tomatoes of the Marglobe variety, but in some cases the 'potato-leaved' or large-leaved variety, Hudson Valley Maid (*Lycopersicum esculentum* var. *grandifolium*), Cherry (*L. esculentum* var. *cerasiforme*), Pear (*L. esculentum* var. *pyriforme*), and Upright (*L. esculentum* var. *validum*) served as hosts. The plants (of which at least five and sometimes ten were used in each treatment) were inoculated by the cotton-needle method with ordinary tobacco mosaic virus (tobacco virus 1) and cucumber virus 1 [ibid., vi, p. 501].

It was found impossible to reproduce the typical fern-leaf symptoms with tobacco virus 1 under any of the environmental conditions to which the infected host was exposed, but the symptoms occasionally developed as a result of inoculation with cucumber virus 1. They could, moreover, be produced regularly and at will by the transmission of cucumber virus 1 from *Nicotiana rustica* to tomato through the agency of the aphid *Myzus persicae* [ibid., viii, p. 518]. The optimum atmospheric temperature for the development of fern-leaf symptoms was found to lie between 18° and 22°, with an approximate minimum and maximum at 15° and 25°, respectively. If the plants are more than 5 inches high, infection by means of the aphid frequently does not result in the development of fern-leaf symptoms but only in chlorosis, mottling, and stunting.

KUNKEL (L. O.). **Transmission of Aster yellows to the Tomato.** —Abs. in *Phytopath.*, xx, 1, p. 129, 1930.

During 1928 a disease resembling aster yellows was reported to be prevalent on tomatoes in Maryland, and experiments were conducted to ascertain whether aster yellows could be transmitted to Bonnie Best tomatoes by grafting from a related Solanaceous host, *Nicotiana rustica*, infected by the disease. Yellowed buds from this host were transplanted to twelve healthy tomato plants, five of which developed the symptoms of aster yellows, while the remaining seven and three controls remained normal. The symptoms persisted in two plants from which the *N. rustica* buds were excised at an early stage. It is concluded that the disease in question is identical with aster yellows, and that it is transmissible to tomato from *N. rustica*. Attempts to transmit aster yellows to tomato by means of the leafhopper *Cicadula sexnotata* [*R.A.M.*, vii, p. 446] gave negative results.

IVANOFF (S.) & RIKER (A. J.). **The movement of the crown-gall organisms in the stems of Tomato plants.**—Abs. in *Phytopath.*, xx, 1, p. 125, 1930.

Studies were made on the movement of *Phytomonas* [*Bacterium*] *tumefaciens* (living and dead), alone and in association with *P.* [*Aplanobacter*] *insidiosum* and *P.* [*A.*] *michiganense* [*R.A.M.*, viii, p. 726; ix, p. 69], and India ink in the stems of young tomato

plants during the first four hours after inoculation. In preparations from this material, the organisms were found in three conditions, i. e., as masses resembling zoogloeal strands, as clumps, and as individual bacteria or particles. No significant progressive movement was observed during the four-hour period after the first two minutes. The dead crown gall bacteria and particles of India ink showed types and rates of movement and distribution within the tissues comparable to those of the living bacteria.

Bryan (Mary K.). **Bacterial canker of Tomatoes—present status of the disease.**—Abs. in *Phytopath.*, xx, 1, p. 126, 1930.

Bacterial canker of tomatoes [*Aplanobacter michiganense*: *R.A.M.*, ix, p. 69] has recently spread by means of infected seed to the southern and western States, where it has caused heavy losses owing to reduction both in the quantity and quality of the fruit. Leaf and stem spotting also occurs but is apparently of less economic importance. The lesions are most conspicuous on the upper part of the plant, a slight discoloration of the xylem often being the only noticeable symptom in the root. As the systemic infection spreads through the cortex to the epidermis it breaks out on the surface in open cankers on the stems, midribs, and small veins, liberating the bacteria which, under favourable weather conditions, produce secondary infections on fruits, leaves, and stems. The attacks on young fruits take place through the numerous delicate surface hairs. Stomatal infections on leaves are at first minute, white, raised cankers, later surrounded by a zone of dead grey tissue. If they are close together, large dead areas may be formed. Infection may reach the vascular system from these spots or similar ones on the stems.

Bryan (Mary K.) & Boyd (O. C.). **Control of bacterial canker of Tomatoes.**—Abs. in *Phytopath.*, xx, 1, p. 127, 1930.

The internal infection of tomato seed by *Aplanobacter michiganense* [see preceding abstract] was demonstrated by planting externally disinfected seed, by cultures, and by microtome sections showing dense masses of bacteria inside the seed coat just below the surface. Hence incomplete control was given by treatment with mercuric chloride or semesan. The organism was destroyed by 50 to 60 minutes' immersion of the seed in water heated to a temperature of 54° C., a process which slightly retards germination but does not reduce the percentage of germination or vigour of the plants. Field obervations to date indicate that soil infection may or may not be important in carrying on the disease from season to season. In New York there has been no recurrence of the disease in fields where it was serious the previous year. In Georgia, however, the bacteria have been found to survive both summer and winter conditions in compost from diseased plants and in fields where infected compost was used the previous year. Selection of seed from clean fields, rotation of seed-beds and fields, and seed disinfection with mercuric chloride are recommended.

Bryan (Mary K.). **An albino strain of Aplanobacter michiganense.** —Abs. in *Phytopath.*, xx, 1, p. 141, 1930.

A pure white strain of the tomato canker organism, *Aplanobacter michiganense* [see preceding abstracts], has been separated from three different isolations at various times. The loss of colour is permanent on culture media. Inoculations on tomatoes with this strain have produced typically diseased plants, from which the white organism has been reisolated. The albino strain, which is Gram-positive and non-motile, agrees with *A. michiganense* in all the cultural tests made.

Faull (J. H.). **Notes on forest diseases in Nova Scotia.**—*Journ. Arnold Arboretum*, xi, 1, pp. 55–58, 1930.

During the latter part of July, 1929, the author was engaged on a survey of the forests of Nova Scotia, where scarcely any attention has hitherto been paid to the fungous diseases of trees.

Two or three vigorous young white pines [*Pinus strobus*] near Chester were found to be suffering from a destructive attack of blister rust [*Cronartium ribicola*], hitherto found in this region only on smooth gooseberry (*Ribes oxyacanthoides*), skunk currant (*R. prostratum*), and black currant (*R. nigrum*).

The highly injurious cone rust [*Chrysomyxa pyrolae*] of the red, black, and white spruces [*Picea rubra*, *P. mariana*, and *P. canadensis*] was found in abundance in many places. Red and black spruces were also attacked by broom rust (*Peridermium coloradense*), a new record for Nova Scotia.

Vaccinium vitis-idaea var. *minus* at Cape Breton was found to be infected by *Thecopsora vacciniorum*, the *Vaccinium* rust of hemlocks [*Tsuga* spp.], this being the first record of the fungus in America.

Of the many rusts of balsam fir [*Abies balsamea*], those caused by *Milesina kriegeriana* and *M. polypodophila* are of interest as new records for Nova Scotia. The former was found in a very heavy infestation in Guysboro Co., manifesting the unusual feature of the adherence of the whitened needles killed by the fungus in the previous year. The latter rust is characterized by the formation of mis-shapen, loosely-broomed trees. *Hyalopsora aspidiotus* was also found on balsam for the first time in Nova Scotia, while *Melampsorella caryophyllacearum* and *Calyptospora goeppertiana* were extremely prevalent on this host, the former causing widespread stunting of trees in Cape Breton and the latter approaching economic importance in Guysboro Co.

Various needle cast diseases of conifers were caused by *Lophodermium* spp. and allied fungi. White spruce and balsam fir suffered from an obscure chlorosis of considerable interest in the western part of the province. A needle blight of balsam caused by *Acanthostigma parasiticum* was abundant at Beaver Bank. 'Red branch', associated in part with insect and frost damage, but largely due to a girdling fungus, *Valsa friesii*, occurs on the same host. Balsam firs were found to be suffering extensively from a disease provisionally termed 'gout', characterized by stunting, tapering of the trunks, swollen joints, and general thickening of the twigs.

Other new records on balsam for this area are *Poria subacida*, *Polyporus balsameus*, *P. schweinitzii*, and *Stereum sanguinolentum*, the last-named, as well as *Trametes pini*, also occurring on spruce. The two last-named fungi are limiting factors in timber production.

The two outstanding diseases of hardwoods are willow blight (*Fusicladium saliciperdum*) [*R.A.M.*, viii, p. 614] and bark disease of beech. A disease resembling the former was also observed on *Populus alba* and Carolina poplar [*P. monilifera* var. *angulata*]. Two further records are a yellow spotting of birch (*Betula populifolia*) leaves by *Exoascus flavus* [*Taphrina flava*] and a bark canker of aspen (*P. tremuloides*) caused by *Hypoxylon pruinatum* [ibid., v, p. 141], the latter being responsible for a heavy mortality (up to 70 per cent.).

Liese (J.). **Neue Wege zur Bekämpfung des Kienzopfs (Peridermium pini). Vorläufige Mitteilung.** [New methods for the control of resin top (*Peridermium pini*). Preliminary note.]—*Zeitschr. für Forst- u. Jagdwesen*, lxii, 1, pp. 47–48, 1930.

During the last eight years the writer has carried out a number of inoculation experiments on Scotch fir [*Pinus sylvestris*] in north Germany with the acidiospores of blister rust (*Peridermium pini*) [*R.A.M.*, iv, p. 376; viii, p. 344]. The results of these tests (details of which are reserved for future publication) confirm the conclusions of Haack (*Zeitschr. für Forst- u. Jagdwesen*, 1914) and Klebahn (*Flora*, 1918) as to the direct transmission of the rust in the regions in question, where the alternate host (*Vincetoxicum officinale*) is frequently absent. The existence of apparently resistant individuals among the trees used in the experiments suggests the possibility of control by selective methods.

Hemmi (T.), Hirayama (S.), & Nojima (T.). **Studies on Fomes ulmarius causing the heartwood-rot of Cryptomeria japonica.** —*Bot. Mag.*, Tokyo, xliii, 516, pp. 657–675, 8 figs., 1 graph, 1929. [Japanese, with English summary.]

Fomes ulmarius Fr. (of which *F. geotropus* Cke is considered to be a synonym) was found in 1926 to be causing a brown pocket rot of the heartwood of the common indigenous conifer, *Cryptomeria japonica*, in southern Honshû and Kiushû (Japan), where several deciduous trees are also affected. The fungus, which appears to be widely distributed in the above-mentioned provinces, was classified, by microchemical tests and cultural experiments (using Bavendamm's method) [*R.A.M.*, viii, p. 211], as belonging to the lignin-dissolving group. The pockets in the heartwood are partially filled with a yellowish-brown powder (sometimes mixed with fibrous masses of semi-decayed wood), and occasionally also with white mycelium, which in pure culture turned to a dirty yellowish colour. In the advanced stage of the disease the pockets usually become entirely empty. Pure cultures of *F. ulmarius* were readily obtained on various agar and liquid media, of which potato decoction proved to be the most favourable. Vigorous growth was made between 24° and 40° C., with an optimum at 36°.

Vanine (S. I.). Гниль дерева, ее причины и меры борьбы. [Wood rot, its causes and control.]—2nd ed. revised and augmented, 165 pp., 67 figs.. Государств. Сельскохоз. Издат. [State Agric. Publications Office], Moscow and Leningrad, 1930.

The second edition of this useful little text-book, destined for Russian students, brings up to date the information relating to rots of living trees and felled timber contained in the first issue [*R.A.M.*, vii, p. 483]. The chief additions are a chapter dealing with discolorations in wood due to fungi and various other causes, and two keys, one for the macroscopical determination of rots in living trees, and the other for the identification of the principal genera and species of the Polyporaceae. The bibliography appended consists of 151 titles.

Reichardt (A. N.), Karakulin (B. P.), & Issatchenko (V. B.). Разрушители древесины и борьба с ними. [Wood destroyers and their control.]—Pamphlet issued by *Госуд. С.-хозяйств. Издат.* [*State Agric. Publications Office*], Moscow and Leningrad, 59 pp., 16 figs., 1930.

In this pamphlet a very brief and semi-popular account is given of the chief species of insects and fungi which destroy felled timber and constructional woodwork in Russia, and of the means for their control. Most of the information regarding fungi deals with those that occur in buildings, such as *Merulius lacrymans, Poria vaporaria, Coniophora cerebella, Fomes roseus*, and *Paxillus acheruntius* [*P. panuoides*], the development of which is stated to have attained threatening dimensions in many parts of the country [*R.A.M.*, ix, p. 354].

Blank (L. M.). **Pathogenicity of a number of collections of the Cabbage-yellows organisms.**—Abs. in *Phytopath.*, xx, 1, p. 114, 1930.

Pure line isolations of the cabbage yellows organism (*Fusarium conglutinans*) [*R.A.M.*, viii, p. 213] from 11 localities in 8 States were tested for their pathogenicity, under controlled soil temperature conditions, on pure lines of resistant and susceptible cabbage, and on F_2 hybrids from resistant-susceptible crosses. The homozygous resistant lines remained entirely resistant to the attack of the various collections of the organism, while the homozygous susceptible strains were uniformly infected. When tested on the F_2 hybrids the segregation of healthy and diseased plants was very close to the expected 3 : 1 ratio. No evidence of selective pathogenicity was found when the collections were tested on other subspecies of *Brassica oleracea*, viz., Brussels sprouts, cauliflower, kale, and kohlrabi. While some variation was noticed in their cultural characters, the pathogenicity range was similar for all the collections of the organism studied.

Walker (J. C.). **The nature of yellows resistance in Cabbage.**—Abs. in *Phytopath.*, xx, 1, pp. 114-115, 1930.

Further evidence is adduced in support of previous data to the effect that resistance to yellows [*Fusarium conglutinans*: see preceding abstract] in cabbage is inherited as a Mendelian

dominant. A study of physiological responses of homozygous resistant lines of cabbage, as compared with mass-selected resistant and susceptible varieties, showed that homozygous resistant lines remain perfectly resistant at a constant soil temperature as high as 24° C., while Wisconsin Hollander shows relatively slight resistance in constant soil temperatures above 20°. No definite symptoms of yellows appear in homozygous resistant lines, even at 28° or above. High air temperatures increase the rate of disease development in susceptible and mass-selected resistant strains, but fail to break down the resistance of homozygous resistant lines. Improved homozygous resistant lines have now been established for three mid-season varieties, All Head Select, Marion Market, and Globe, and for two early-market varieties, Jersey Wakefield and Golden Acre or Early Copenhagen Market, of which the former will be available for general use in the autumn of 1930 under the name of Jersey Queen.

WADE (B. L.). **Inheritance of Fusarium wilt resistance in canning Peas.**—*Wisconsin Agric. Exper. Stat. Res. Bull.* 97, 32 pp., 5 figs., 2 graphs, 1929.

In this comprehensive study (accompanied by numerous tables) of the inheritance of wilt (*Fusarium orthoceras* var. *pisi*) [*R.A.M.*, viii, p. 214] resistance in canning peas in Wisconsin, the writer presents data indicating that this character is due to a single dominant factor, designated by him 'Fw', while the recessive allelomorph for susceptibility is termed 'fw'. For the most part, the data strongly support the single factor hypothesis, the exceptions to this rule being explicable by the masking of wilt symptoms through early maturity and the escape of susceptible plants owing to an irregular distribution of inoculum.

Linkage studies of resistance with two other factor pairs (sugariness and tallness) were carried out. The results indicate that there is no linkage between resistance and sugariness, but a loose linkage of about 31 per cent. between resistance and tallness. The tall F_2 segregates from Horsford (susceptible) × Resistant Alaska wilted at a somewhat lower rate than the short segregates, especially in the initial stages.

NELSON (R.). **Cytological and bacteriological investigations of Bean mosaic.**—*Journ. of Bact.*, xix, 1, p. 22, 1930.

In this paper (read at the thirty-first annual meeting of the Society of American Bacteriologists held at Ames, Iowa, from 30th December, 1929, to 1st January, 1930) an account was given of a cytological study of two kinds of bean [*Phaseolus vulgaris*] mosaic [*R.A.M.*, viii, pp. 22, 748; ix, p. 355], viz., the mottle type common on pea beans and rugose mosaic on Refugee. Free-hand, unstained sections from petioles were mostly used, supplemented by paraffin sections coloured with iron hematoxylin and Giemsa stains. The presence of a minute organism has repeatedly been demonstrated in chloroplasts from diseased plants. It is often found in large numbers in the cytoplasm of the phloem, xylem, and parenchymatous tissues. The invaded chloroplasts at first show a small vacuolized area containing the organism. Eventually the

chloroplasts are destroyed and the organism is found in abundance in the plastid detritus. It may be localized or widely distributed in the plant. The organism is apparently a minute coccus occurring usually in single, 'diplo', or chain form, but exhibiting considerable pleomorphism.

Using modified bacteriological methods, it is claimed that successful isolations have been made from very young seeds taken aseptically from immature pods, and from leaf tissues of mosaic plants grown under sterile conditions. The percentage of successful isolations from seeds apparently corresponds with the number of mosaic plants obtained from seed harvested from diseased plants. The pathogenicity of the organism (which is sensitive to cultural conditions and requires frequent subculturing) has not been demonstrated, and a morphologically similar organism has been isolated from highly susceptible bean varieties showing no apparent symptoms of mosaic.

HEDGES (FLORENCE). **The relationship of Bacterium medicaginis phaseolicola and Bacterium puerariae.**—Abs. in *Phytopath.*, xx, 1, p. 140, 1930.

Cross-inoculation experiments with pure cultures of *Bacterium medicaginis* [var.] *phaseolicola* [*R.A.M.*, vi, p. 331] and *Bact. puerariae* [ibid., vi, p. 422] resulted in the production of typical kudzu [*Pueraria hirsuta*] halo blight and bean [*Phaseolus vulgaris*] halo blight with both, thereby confirming the writer's suspicions that they are identical. The first of these two names has priority.

SARDIÑA (J. R.). **Una nueva especie de Botrytis que ataca a las Habas.** [A new species of *Botrytis* attacking Broad Beans.] —*Mem. R. Soc. Española Hist. Nat.*, xv, 1, pp. 291–295, 3 figs., 1929.

Broad beans (*Vicia faba*) in various parts of Spain were attacked in 1928 and 1929 by a species of *Botrytis* which caused decay of the leaves and stems. The fungus (which is considered to be previously undescribed and is named *B. fabae* n. sp., with a Latin diagnosis) is characterized by a sparse, chestnut-brown (later whitish but never grey) mycelium; brown, erect, branched conidiophores, 162 to 351 μ in length, swollen at the apices, bearing on short sterigmata ovoid conidia measuring 15·2 to 24·3 by 10·9 to 18·2 μ (average of 200, 20·6 by 14·6 μ), grouped in heads 39 to 63 μ in diameter; and by semi-spherical or semi-ellipsoidal, black sclerotia (occurring exclusively in culture), measuring 1 to 3·6 by 0·9 to 2·2 by 0·4 to 2 mm. (average of 25, 1·7 by 1·5 by 0·9 mm.). Broad bean plants inoculated with spore suspensions of the fungus developed the typical symptoms of the disease.

MERRILL (E. D.). **Breeding Sugar Beets for resistance to curly top.**—*Ann. Rept. California Agric. Exper. Stat. for the year ending 30th June, 1929*, p. 64, 1929.

The following are amongst the sugar beet strains under observa-

tion at the Davis Experiment Station, California, with a view to determining their resistance to curly top [*R.A.M.*, vi, p. 10]: (A) Eighteen progenies of the fourth and fifth generation of the Spreckels Sugar Company P-19 strain, which has an established character of resistance, manifested by an increased yield as compared with the commercial seed when both are grown under exposure to curly top infection, a high percentage of surviving beets, and a tendency to develop only mild symptoms of the disease. Among the less desirable characters of this strain is its relatively low sugar content, but an improvement in this and other respects may be effected by hybridization.

(B) Twelve progenies and mixtures of progenies of F_1 and F_2 generations of hybrids between the P-19 and other strains, of which the most promising with regard to resistance, vigour, vitality of seed, and shape of root is P-19 × Dr. Carsner's California (resistant) strain. The hybrids between P-19 and susceptible strains of high sugar content show a considerable degree of resistance, but their sugar content cannot be estimated until the harvest.

(C) Sixteen progenies and one mixture of progenies of the second generations of mass-selected mother beets of 1925 (i.e., of new initial selections from commercial fields which were carried out in that year). In addition to a marked degree of resistance to curly top, these progenies are characterized by a better root shape and a higher sugar content than P-19.

SHAPOSHNIKOV (J. J.). **Russian Beet variety resistant to curly top.**—*Sovietskii Sakhar, 1929*, pp. 570–571, 1929. [Abs. in *Facts about Sugar*, xxv, 9, p. 216, 1930.]

In 1926 some sugar-beet seed of the P-19 variety, produced in California [see preceding abstract], was sent to its original home at Ivanovka (Russia) to be replanted, the object being to ascertain whether the new crop of Russian-grown seed would maintain its character of resistance to curly top when brought back to California. The seeds (A) grown at Ivanovka in 1928 from the seed produced in California were planted at Davis in the spring of 1929 in comparison with (B) original Ivanovka seed and (C) seed of P-19 produced in the interim at Davis. In each case a control plot was planted with old type Kleinwanzleben seed. The following results were obtained. (A) percentage of surviving plants 86 (control 40); weight of beets in kg. per 100 ft. of row 26·69 (8·92); sugar content 14·1 per cent. (16·2). (B) percentage of surviving plants 94 (47); weight 26·87 (10·09); sugar content 14·1 per cent. (15·5). (C) percentage of surviving plants 91 (36); weight 24·25 (6·47); sugar content 14·1 per cent. (16·1).

The resistance to curly top is evident in the percentage of survivors under attack and the great difference in the weight of the beets from 100 linear feet of row. The sugar content of P-19 is distinctly inferior to that of the controls, but this is counterbalanced by the virtual absence of loss from curly top, which in susceptible varieties may amount to two-thirds of the crop.

Swezy (Olive). **Factors influencing the minimum incubation periods of curly top in the Beet leaf hopper.**—*Phytopath.*, xx, 1, pp. 93–100, 3 figs., 1930.

The results of experiments [the technique of which is fully described] to determine the factors influencing the minimum incubation periods of curly top in the beet leaf-hopper (*Eutettix tenella*) [*R.A.M.*, viii, p. 83] indicated that two conditions might be responsible for the occasional transmission of the disease at such short intervals as half-an-hour or an hour after feeding on infective material. In one insect an abnormal state of the intestinal tract, induced by the presence in the oesophagus of masses of bacteria was found, and it is suggested that this condition might hinder the free passage of food, which would consequently be ejected shortly after consumption. It is also thought possible that the infective principle may, in rare instances, pass so promptly through the body of the insect that it reaches the salivary glands in an unchanged condition and is immediately ready to infect new plants on ejection with the saliva.

Cook (H. T.). **The presence of mycelium of Peronospora schleideni in the flowers of Allium cepa.**—Abs. in *Phytopath.*, xx, 1, pp. 139–140, 1930.

Evidence in support of the view that the causal organism of onion mildew (*Peronospora schleideni*) [*R.A.M.*, vii, p. 217] is carried in the seed was obtained in New York State in the summer of 1928, when the fungus was found fruiting on the seed stalk and flower pedicels of an onion. The mycelium was observed to permeate the seed stalk and to occur in profusion in the petals, stamens, ovary, and ovules of the flowers, its presence in the last-named organ indicating that it is also contained in the mature seed.

Rieman (G. H.). **The inheritance of disease resistance in the Onion.**—Abs. in *Phytopath.*, xx, 1, pp. 115–116, 1930.

Coloured bulb onions exhibiting a high degree of resistance to the parasitism of the smudge organism (*Colletotrichum circinans*) were crossed with susceptible colourless bulb individuals [*R.A.M.*, ix, p. 284]. Two factors responsible for resistance to the fungus have been detected, viz., a gene for red colour which the author designates *W*, and *Wy*, a gene for yellow pigment. Two different genes for the expression of whiteness, involving susceptibility, have been found to be genetically distinct, namely, *I*, a dominant inhibitor of red and yellow colours, and *w*, a gene for white. In the F_2 and F_3 generations of crosses between red and white varieties, white bulbs appeared which were intermediate in their resistance to onion smudge. The interaction of the dominant inhibitor gene, *I*, and the gene for red, *W*, effects the production of toxic chemical entities producing intermediate resistance.

Porter (R. H.). **A new mosaic disease of Cucumber.**—Abs. in *Phytopath.*, xx, 1, p. 113, 1930.

Inoculation experiments with material of cucumber mosaic obtained in March, 1929, from Bettendorf, Iowa, produced 100 per

cent. infection in selfed lines of the Chinese Long variety, as well as in White Spine. The 'Bettendorf mosaic', which appears to be relatively uncommon, differs from the ordinary 'white pickle' [*R.A.M.*, vii, p. 423; viii, p. 352] in symptoms, incubation period, and host range. Cucumbers affected by white pickle show marked stunting, drooping of the terminal leaves, faint to prominent mottling, and fruit infection; the incubation period is three to six days. Infection occurs readily on cucumbers, cantaloupes, and African stock citron [*Citrullus vulgaris* var.], but not on watermelons or the Chinese Long variety of cucumber. The symptoms of 'Bettendorf mosaic' on cucumbers are rigidity of the terminal leaves accompanied by the development of yellow blotches, distinct at first and later confluent; the incubation period is 6 to 15 days. All cucumber varieties are susceptible, while watermelon and stock citron are also readily infected, though on these hosts the symptoms may be masked.

PORTER (R. H.). **The resistance of Cucumbers to mosaic.**—Abs. in *Phytopath.*, xx, 1, p. 114, 1930.

Individual, mass-selected plants and selfed lines of the Chinese Long cucumber variety are highly resistant to 'white pickle' mosaic [see preceding abstract]. Three successive inoculations into the same plants at 12-day intervals failed to produce symptoms, and repeated attempts to transfer the disease from such plants to susceptible hosts also gave negative results. Occasionally a susceptible individual of the Chinese Long variety may have mosaic but with masked symptoms. Susceptibility to mosaic is dominant, but F_1 plants of Chinese Long × White Spine are less severely stunted than the susceptible parent. Seeds from a back cross of F_1 × White Spine produced plants yielding the short pickling type of fruit. Part of these are susceptible and part resistant, but no genetic ratios have yet been determined. Nine out of 29 plants of this back cross exposed to two different inoculations remained resistant, and three attempts to transfer mosaic from these nine to susceptible plants were unsuccessful.

PORTER (D. R.). **Pathogenicity of Fusarium niveum and the resistance of some Water melon hybrids.**—Abs. in *Phytopath.*, xx, 1, p. 116, 1930.

Morphological and physiological differences were apparent in seventeen isolations of *Fusarium niveum* from watermelon in widely separated localities [*R.A.M.*, vii, p. 760]. Seedling rot and seedling wilt due to this fungus are most severe at soil temperatures of 16° to 18° and 25° to 28° C., respectively. In the field a positive correlation between the rate of wilting and the air temperature was suggested. Various edible hybrids showing some degree of wilt resistance have been obtained, the most promising being a resistant genotype from the susceptible Kleckley Sweet variety.

WILSON (J. J.) & LAYTON (D. V.). **The resistance of a Watermelon genotype to Fusarium niveum.**—Abs. in *Phytopath.*, xx, 1, p. 116, 1930.

Inbreeding and natural segregation led to the further isolation of

lines having increased resistance to wilt (*Fusarium niveum*) in the progeny of K-S4, a genotype isolated in 1927 from the ordinary susceptible watermelon variety, Kleckley Sweet [see preceding abstract]. The progeny of 22 inbred F_2 melons showed 8·7 to 73·3 per cent. resistance in the 1929 tests. Of the 1,759 plants obtained from the F_2 melons, 54 per cent. were alive on 11th July and 35 per cent. completed the full season's growth, bearing a heavy crop of high-quality melons. Of the 1,731 susceptible controls of the Kleckley Sweet variety, only 6 per cent. were alive on 11th July.

HOGGAN (ISMÉ A.). **Transmission of Cucumber mosaic to Spinach.**—*Phytopath.*, xx, 1, pp. 103–105, 1 fig., 1930.

Recent experiments at Madison, Wisconsin, have shown that cucumber mosaic is readily transmissible to spinach by the peach aphid (*Myzus persicae*) and the potato aphid (*Macrosiphum solanifolii*) [*M. gei*: *R.A.M.*, ix, p. 413], the virus being recoverable from the latter host by the same agency. The symptoms produced on spinach by cucumber mosaic are stated to be extremely similar to those of the spinach blight or mosaic described by McClintock and Smith [ibid., vii, p. 136]. They include malformation and mottling, followed by progressive yellowing and necrosis of the foliage, with marked stunting and ultimate death of the plants. These resemblances, in conjunction with the identity of the insect vectors in both cases, suggest a possible relationship between the two diseases which it is hoped to elucidate by further researches.

VOLK (A.). **Das diesjährige starke Auftreten der Mosaikkrankheit (Gelbfleckigkeit) des Spinates.** [The current year's widespread occurrence of mosaic disease (yellow spotting) of Spinach.]—3 pp., 3 figs., Inst. für Pflanzenkrankh. der Landw. Hochschule Bonn-Poppelsdorf, [? 1929. Received April, 1930.]

Attention is drawn to the severity and extent of the current season's epidemic of spinach mosaic [see preceding abstract] in the foothills between Bonn and Cologne. The loss from the disease was at least 30 to 40 per cent., while in many fields it amounted to 90 or 100 per cent. The insects mainly responsible for the transmission of spinach mosaic in Germany [the symptoms of which are described] are *Macrosiphum pisi*, *Aphis fabae* [*A. rumicis*], and *Myzoides* [*Myzus*] *persicae*, which infest a number of other cultivated plants and weeds. At the time when spinach is usually sown, i. e., at the middle or end of August, most of the other hosts of the insect vectors have become woody and unsuitable as food plants, so that the spinach provides almost the sole means of sustenance. It is advisable, therefore, in seasons of heavy insect infestation, to postpone the sowing of the spinach until the end of September or middle of October. *M. persicae* is especially prevalent in the extensive peach orchards of the Rhenish foothills, and the complete extermination of the aphids is scarcely feasible.

Goto (K.). **On the black-spot disease of Dioscorea alata and D. batatas.**—*Journ. Soc. Trop. Agric.*, Formosa, Japan, i, 3, pp. 301–313, 7 figs., 1929. [Japanese, with English summary.]

During the summer of 1929 the leaves and stems of the yams, *Dioscorea alata* and *D. batatas*, in Taihoku (Formosa) were attacked by a species of *Gloeosporium* (or *Colletotrichum* if importance be attached to the presence of setae) believed to be identical or closely allied with *G. pestis* Massee. The pathogenicity of the fungus was tested by repeated inoculations, reisolations, and reinoculations.

Lambert (E. B.). **Studies on the relation of temperature to the growth, parasitism, thermal death points, and control of Mycogone perniciosa.**—*Phytopath.*, xx, 1, pp. 75–83, 1 fig., 2 diags., 1 graph, 1930.

The results [which are fully described] of experiments conducted at Coatesville, Pennsylvania, to determine the effect of temperature on the growth, pathogenicity, and control of *Mycogone perniciosa*, the causal organism of the bubbles disease of edible mushrooms [*R.A.M.*, vii, pp. 142, 488] showed that the minimum, optimum, and maximum temperatures for the development of the fungus are 8°, 24°, and 32° C., respectively. The temperature range at which the most active growth occurred, viz., 21° to 28°, is higher than that to which the mushrooms are normally exposed during cultivation. The results of tests to ascertain the relation of temperature to infection by *M. perniciosa* showed that infection regularly succeeded in the cultures kept at 21° and 15° but only occasionally at 10°. In agar cultures the fungus was killed by exposure to a temperature of 42° or above for six hours or more. The bubbles disease did not develop in mushroom cultures in artificially infected damp soil that had been subjected to temperatures of 45° and 52° for 12 or 24 hours; all the control cultures contracted infection, which also occurred occasionally in cultures exposed to high temperature for only six hours. The disease was also controlled by subjecting artificially and naturally infested soil to heat generated by the normal fermentation of manure in a commercial mushroom house.

Nagorny (P. I.) & Issarlischwili (S. J.). Неизвестные для Кавказа представители микофлоры Виноградной лозы. [Representatives of the fungal flora of the Vine hitherto unknown in the Caucasus.]—*Bull. Inst. of Exper. Agric. of Georgia, Tiflis, 1929*, 1, pp. 5–18, 1929. [German summary.]

Brief notes, including some morphological details, are given on 19 species of fungi which were collected from 1925 to 1928 on the vine in Transcaucasia, this being the first official record of these organisms in that region. The following are of phytopathological interest. *Exidia glandulosa* occurs rather frequently on the living branches of a number of varieties of the vine. *Stereum hirsutum* occurs chiefly on living stocks of the Cabernet variety, but was also found on stocks of other varieties killed by 'apoplexy' [*R.A.M.*, viii, p. 222]. *Polyporus radiatus* was recorded several times on living stocks of the Krakhouna variety, and *P. hispidus* once only

on the stock of an unnamed variety, the same being also the case with *Crepidotus mollis*. *Phoma vinifera* Cke appears to be fairly frequent on the berries of the Sémillon and some local varieties. *Diplodia bacchi* Passer. & Thuem. was only found on the berries in Imeretia. *Colletotrichum vitis* Istv. was observed on the dying branches of an American vine. In some localities of Imeretia the grapes were also attacked by *Gloeosporium physalosporae* Cav. and *Monilia* [*Sclerotinia*] *fructigena*.

RAVAZ (L.). **Chronique : Dernière heure. Le mildiou.** [Current events : latest news. Mildew.]—*Prog. Agric. et Vitic.*, xciii, 15, p. 349, 1930.

The author received information from the Montpellier Agricultural Intelligence Station [cf. *R.A.M.*, iii, p. 468] that the oospores of *Plasmopara viticola* kept under observation there began germination on 8th April, with the result that a first invasion of the disease in exposed areas was to be anticipated about the 16th of the month ; this might be expected to affect leaves nearest the ground and to be comparatively unimportant.

MCRAE (W.). **Report of the Imperial Mycologist.**—*Scient. Repts. Agric. Res. Inst., Pusa, 1928–9*, pp. 51–66, 1930.

Further investigations into the effect of fertilizers upon the incidence of pigeon pea wilt (*Fusarium vasinfectum*) [*R.A.M.*, viii, p. 224] at Pusa, India, again demonstrated that soil dressings with superphosphate favoured the disease, while green manure checked it ; when both were applied, the amount of disease was intermediate between the results obtained when they were applied separately. To observe the influence of superphosphate on the root development of the plants, pits were dug 3 ft. deep, each foot of soil being kept separate ; the moisture content of each layer was brought up to the local optimum, and sufficient superphosphate was added before replacement to ensure that the soil contained 0·002 per cent. of soluble P_2O_5. The seed was sown after the rains in September and no water was given during the five months that the plants were growing. Subsequently, in the two top layers so treated the larger roots were more numerous and the branching rootlets much more so than in untreated plots, though in the lowest layer the difference was not very marked.

The Co. 205 variety of sugar-cane, which is so susceptible to mosaic [ibid., viii, pp. 63, 424] that its cultivation is to be discontinued, was again badly affected ; roguing was carried out for three seasons without eliminating the disease owing to the fact that some canes do not show any symptoms until late, while in others they disappear early.

A top rot of sugar-cane closely resembling 'pokkah boeng' [ibid., ix, p. 341] was present during recent years in scattered clumps in a field in Bihar ; it has not caused any appreciable loss, but is becoming slightly more common, sporadic attacks being noted on Co. 210 and Co. 213. The first symptoms consist in pale red patches on the lower parts of the young unfolded leaves where they are attached to the leaf sheath ; these patches later darken and begin to split. Sometimes chlorotic patches appear first,

followed by reddening. In light attacks the leaves open normally but remain stunted, and the stalk continues to grow, but becomes very thin at the top. In severe cases the leaves do not open and the growing point rots.

Of 403 wilted *Piper betle* plants [ibid., viii, pp. 224, 264], 7 showed the presence of *Sclerotium* [*rolfsii*], 36 that of a *Phytophthora*, 265 that of *Rhizoctonia* [*Corticium*] *solani*, and 95 both *Phytophthora* and *C. solani*. The disease occurred after the monsoon and was effectively controlled by spraying.

Several diseases of *Cinchona ledgeriana* [ibid., viii, pp. 89, 224] were investigated. Pink disease (*Corticium salmonicolor*) was fairly prevalent in the plantations at Mungpoo and Munsong [Sikkim Himalaya]. A stem bleeding disease occurs as red areas on the trunk or branches, characterized by rusty brown patches with narrow streaks extending downwards. Under the patches the bark was dead, in some cases as far as the cambium; small areas of disintegrated cells were found from which the bleeding probably occurred. In some cases bleeding occurs where the brown discoloration is not visible, and in others the condition is reversed. In some of the latter the bark had cracked longitudinally down to the wood, and hyphae with clamp-connexions were found in a layer next the wood. The condition was severe at Mungpoo and Munsong on blocks planted in 1919, especially at elevations of 2,500 to 3,500 ft. A seedling disease at Munsong affected plants 15 months old, the upper leaves turning a dingy yellow; all the leaves reddened and drooped, longitudinal depressions appeared near the base of the stem, and the plants died. Drought and excess of water are reported to induce a similar condition. At Mungpoo another seedling disease killed off small patches of plants in very wet weather, or when the nurseries were watered; a species of *Phytophthora* was isolated from the affected plants, and inoculations with it of 15 young seedlings on three occasions resulted in the death of 9, 15, and 10 plants, respectively. In a further test seven inoculated plants all died, the average atmospheric temperature being about 27° C.; in another locality seedlings inoculated at about 20° did not become infected, though at Munsong, where the temperature averaged 22°, many of the inoculated seedlings succumbed. Under moist conditions the fungus was undoubtedly parasitic on the seedlings.

Artificial infection experiments showed that 30 types of gram [*Cicer arietinum*] were susceptible to the blight previously reported [ibid., viii, p. 224] as due to a species of *Mystrosporium*. The growth of the fungus in culture was checked at 34°, when spore production almost ceased.

Sclerotium bataticola readily attacked wounded *Sesamum indicum* plants, which soon collapsed; the infected plants were blackened and bore numerous pycnidia of *Macrophomina phaseoli*.

The life-history of *Sorosporium paspali* [loc. cit.] causing smut of kodra [*Paspalum scrobiculatum*] has now been worked out. The maximum temperature for spore germination was between 34·5° and 37·5°, the minimum below 19°, and the optimum about 30°. The fungus is propagated mainly by seed-borne spores. Control was effected by steeping the seed in a 1·5 per cent. copper

sulphate solution for 30 minutes or by dusting with copper carbonate applied at the rate of 1 oz. per 10 lb. of seed. Seed treated by either method may be kept at least two months without any impairment of its germinative power.

Helminthosporium sativum was epidemic on wheat in the vicinity of Pusa.

SANFORD (G. B.). **Report of the Dominion Field Laboratory of Plant Pathology, Edmonton, Alberta.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 107–116, 2 figs., 2 graphs, 1929. [Received May, 1930.]

Most of the cases of root rot in spring wheat in Alberta were found to be due to *Ophiobolus graminis* [see below, p. 447]. Observations on the effects of crop rotation on the incidence of root rot showed that infection is reduced to a minimum where wheat immediately follows breaking the virgin sod, whereas the severity of the disease is often very marked on the third or fourth successive wheat crop after breaking, or when wheat follows wheat for more than two years in old land. The author's observations are strongly against the view that take-all tends to disappear in land that has been long under cultivation.

Of the 64 wheat varieties exposed to infection by yellow rust (*Puccinia glumarum*), only one (Chagot) contracted the disease in a severe form.

The sporophores of *Fomes igniarius* [*R.A.M.*, viii, p. 411] were found on dying aspens (*Populus tremuloides*). *Polystictus* ? *pergamenus* [ibid., ii, p. 484] is of frequent occurrence on fallen aspens and round the butts of diseased trees. *Cytospora chrysosperma* [ibid., vii, p. 285] appears to be the cause of severe lesions and death of both old and young aspens.

BERKELEY (G. H.). **Report of the Dominion Field Laboratory of Plant Pathology, St. Catharines, Ontario.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 119–130, 1929. [Received May, 1930.]

The orchard spray service, now in its fifth year, had 200 adhering members during the period under review. From the last week in March until the end of July, 17 different notices, giving detailed instructions regarding the various applications to fruit trees, were circulated.

A new sulphur spray known as wettex proved effective against apple scab (*Venturia inaequalis*) [*R.A.M.*, ix, p. 113] on the Duchess variety, but not on McIntosh, on which the trees treated with this preparation showed nearly 50 per cent. severe infection compared with only 5·4 per cent. in the lime-sulphur block.

In connexion with a study of perithecial development in *V. inaequalis* (by G. C. Chamberlain) two lots of McIntosh apple leaves were gathered on 15th October and 15th November, respectively, the latter date approximating to the normal time of leaf fall for that year. The leaves were placed at various temperatures in controlled incubators, and on the 1st of each month from January until April, 1927, material was prepared for sectioning. From the

data [which are tabulated] obtained by these methods, it is evident that perithecial development in *V. inaequalis* occurs at various temperatures, viz., 3°, 6°, 9°, 12°, and 20° C. A larger number of perithecia developed in the group of leaves gathered on 15th November than in the samples collected a month earlier (464 compared with 187). The most advanced stage of development was observed in material from leaves held at 3° and examined on 1st February, when out of 282 perithecia sectioned, 15 were found containing mature ascospores and 39 with the asci formed. No further mature asci were found except one on April 1st when observations ceased.

Further investigations were conducted by A. R. Walker on strawberry root rot [ibid., viii, p. 354], which was prevalent in the Niagara Peninsula, causing losses amounting to 50 per cent. Apparently healthy Glen Mary and William Belt plants were inoculated with various organisms which had given positive results in the previous season, including *Ramularia* sp. and *Fusarium* sp. The four plants inoculated with these fungi (two with each) developed the typical symptoms of infection, while in the remaining 48 cases the results were inconclusive. The outcome of these studies indicates that the root rot problem is of a complex nature, involving several factors in addition to actual infection by the above-mentioned organisms.

Negative results have so far been given by all experiments to determine whether tomato streak [ibid., ix, p. 415] is carried in the seed, only four out of 500 plants from diseased seed having developed symptoms of infection (which is believed to have come from an outside source). Streak is produced in tomatoes of the Grand Rapids or Bonny Best varieties by inoculation with the juice of healthy Green Mountain or Irish Cobbler potatoes, but the Chalk's Jewel and Sunrise tomatoes do not react to this mode of infection. A preliminary test to ascertain whether streak is carried in the soil gave positive results, the highest incidence of infection (17 out of 18 plants) occurring among seedlings planted in soil previously occupied by diseased tomatoes and further contaminated by the addition of macerated streak pulp.

McLarty (H. R.). **Report of the Dominion Field Laboratory of Plant Pathology, Summerland, B.C.** — *Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 142–162, 5 figs., 1 diag., 1929. [Received May, 1930.]

Promising results in the control of perennial canker of apples (*Gloeosporium perennans*) were again obtained by the application of wound dressings in the form of rape seed oil, pine tar, and castor oil, of which the first named was the most efficient [*R.A.M.*, viii, p. 385]. These substances exclude the woolly aphis [*Eriosoma lanigerum*] from the wounds and thereby eliminate an essential factor in the spread of infection. The presence of these insects was shown, by an experiment in which 130 cankers were wrapped in cotton for six months so as to prevent the aphids from reaching the cankers and subsequently examined for the occurrence of fresh infections, to be necessary for the spread of infection [cf. ibid., viii,

p. 655]. In each case where aphids were present there was a spread of infection, but where there were no aphids there was no spread. *G. perennans* was further found to be capable of producing a serious rotting of fruit in storage. Needle puncture inoculations caused a rotting in apples stored in the storage cellar for 40 to 46 days, which varied in diameter from 9/16 inch in the Winesap, Jonathan, and Winter Banana to 1 inch in the Wealthy variety.

No parasitic organism has been found to be associated with a serious disturbance of apple trees in the Okanagan district, known as 'crown rot' [ibid., viii, p. 385]. In one orchard this disease caused a total loss of 24 per cent. of the trees and damage to a further 35 per cent., with a consequent loss in production of nearly 50 per cent. Crown rot assumes three different aspects, namely, a powdery dry rot characterized by superficial greyish-white patches on the roots or crown, or both; a slimy rot, also more or less superficial, of the same parts of the tree; and a very serious epidemic form in which the crown and roots appear perfectly healthy, but below the surface of the outer bark they are more or less extensively necrosed.

Further studies on the etiology of corky core, drought spot, and die-back of apple [ibid., viii, p. 48] confirmed previous observations to the effect that these disturbances are closely correlated with rootlet injury in the late summer and autumn. Severe root killing took place in August, 1927, on some experimental plots left too long without water; the affected trees lost about 90 per cent. of their total absorbing surface, and the 1928 crop showed a large amount of corky core. Details are given of the cultural methods employed in nine orchards for the correction of the above-mentioned conditions.

In connexion with research on vegetable diseases in the Okanagan district, G. E. Woolliams observed a severe attack of club-root of cabbage (*Plasmodiophora brassicae*) on the Danish Ballhead variety, 90 to 100 per cent. infection occurring on about three-quarters of the acreage involved. This is stated to be the first record of the disease in the locality under inspection. A small patch of Chinese cabbage (*Brassica pekinensis*) was totally destroyed by the fungus.

Fungicidal treatment with a number of standard preparations proved ineffective against neck rot of onions (*Botrytis allii*) [ibid., viii, p. 591], which impedes the production of the crop in certain sections of Kelowna.

The *Fusarium* bulb rot of onions [ibid., viii, p. 419] was first detected on 7th June, and from 5th July onwards the typical symptoms of the disease continued to develop until the crop was harvested.

HURST (R. R.). **Report of the Dominion Field Laboratory of Plant Pathology, Charlottetown, Prince Edward Island.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 165–186, 4 figs., 4 graphs, 1929. [Received May, 1930.]

A continuation of the plant disease survey has disclosed the

presence of several diseases new to the province, including *Alternaria* tuber rot of potatoes [*A. solani*: cf. *R.A.M.*, ix, p. 335], *Phoma* rot in association with powdery scab of potatoes [*Spongospora subterranea*: cf. ibid., v, p. 469; vii, p. 425], *Sclerotinia* blight and leaf spot of hollyhock [*Althaea rosea*], and crinkle of potatoes [ibid., viii, p. 592].

The average amount of mosaic in the total number of fields inspected was 0·568 per cent.; 0·065 per cent. in the total fields passed, and 2·411 per cent. in those rejected. The average incidence of leaf roll in the total fields inspected was 0·017 per cent.; 0·009 per cent. in those passed, and 0·043 per cent. in those rejected. Nine fields (23½ acres) were rejected for leaf roll and 608 (2,875 acres) for mosaic, representing 0·143 and 9·72 per cent., respectively. The Green Mountain variety was the principal variety grown for certification. By means of the tuber unit method, employed in 1927 and 1928, twenty varieties of potato, including Green Mountain, Irish Cobbler, McIntyre, Spaulding Rose, and Bliss Triumph, have been obtained apparently free from virus diseases.

An investigation was made (with J. L. Howatt) of the reduction of the strength of mercuric chloride in solutions repeatedly used for the seed treatment of potatoes against *Rhizoctonia* [*Corticium solani*] and scab [*Actinomyces scabies*] as commonly practised in Prince Edward Island [ibid., viii, p. 660]. In 1925, when these studies were initiated, the seed tubers were usually immersed for 1½ hours in a solution of corrosive sublimate and water (1 : 1,000), ¼ oz. of the chemical being added after each treatment to counterbalance the reduction resulting from the first soak, and the water increased to its original volume (25 galls.). This was repeated until eight to ten lots had been treated, after which a fresh solution was prepared. It was found that the addition of ¼ oz. to the solution was insufficient to maintain the fungicidal strength, but satisfactory results were obtained by the addition of ½ oz. An analysis of the various impurities contained in the solutions showed that the greatest reduction was caused by potato juice, which removed about 11 per cent. of mercuric chloride, the corresponding figures for potato disks and damp and dry soil being 10, 7, and 6 per cent. respectively. Large sclerotia of *C. solani* were found to retain their viability in solutions of corrosive sublimate weaker than and including 1 in 1,250 (1½ hours' immersion). One per cent. viability occurred in the 1 in 1,000 treatment, while all small sclerotia were generally killed at 1 in 1,300. Presoaking for 24 hours rendered the sclerotia more susceptible to treatment, no viability occurring at 1 in 1,000. It is apparent from the foregoing data that corrosive sublimate solutions should be discarded when reduced to 1 in 1,250 (after the third or fourth soak).

HEALD (F. D.). **Division of Plant Pathology.**—*Thirty-ninth Ann. Rept. Washington Agric. Exper. Stat. for the fiscal year ended June 30, 1929* (*Bull.* 237), pp. 38–41, 1929.

The only organic mercury preparation giving control of *Rhizoctonia* disease of potatoes [*Corticium solani*] approximating to that given by mercuric chloride was D.D.D. No. 76 B [cf. *R.A.M.*, vii,

p. 263], which was responsible, however, for a considerable reduction of germination.

It has been shown by greenhouse experiments that streak disease of tomatoes may be produced by combining the juice from a mosaic tobacco plant with that from a mosaic potato plant and rubbing it on the tomato foliage [ibid., viii, p. 409]. The disease is rapidly spread to healthy neighbouring plants by the ordinary pruning and cultural practices. In recent experiments the streak-infected plants yielded 25 per cent. less fruit than the healthy ones.

Beet mosaic (as distinct from curly top) [ibid., vii, p. 355 *et passim*] caused very heavy damage in the Puget Sound district, where every planting inspected showed practically 100 per cent. infection.

Wilt or stem rot of lucerne (*Sclerotinia trifoliorum*) [ibid., viii, p. 793] continued to cause heavy losses to young plantings in widely separated localities west of the Cascades.

Apple blotch (*Phyllosticta solitaria*) was found in a single instance on young trees imported from Missouri [ibid., ix, p. 22].

Black spot of larkspur (*Bacillus* [*Bacterium*] *delphinii*) [ibid., ix, pp. 112, 287] was first detected in Washington State during 1929.

Plant diseases.—*Forty-second Ann. Rept. Georgia Agric. Exper. Stat. for the year 1929,* pp. 16–20. [1930.]

Tests conducted at the Georgia Experiment Station indicated that certain tomato selections from a Burpee × Globe cross and from back crosses with Globe were highly resistant to wilt (*Fusarium*) [*lycopersici*] and also to blight (*Septoria*) [*lycopersici*], one selection appearing from a year's trials to be almost immune from the former.

Inoculations with organisms isolated from rosetted peach branches [cf. *R.A.M.*, viii, p. 425] gave negative results.

During August and September, 1929, *Sclerotium rolfsii* [loc. cit.] was unusually destructive to pepper [*Capsicum annuum*]. A field test in which the plants each received an application of 5 lb. hydrated lime, 1 lb. ceresan, or 1 lb. Du Pont's KlQ, a further plot remaining untreated as a control, gave, respectively, 73·5, 94·7, 83·1, and 68·8 per cent. healthy plants.

A new anthracnose of pepper fruits, caused by an undetermined species of *Colletotrichum*, was observed. Inoculations showed that the causal organism was actively parasitic. Infection occurred at any time during the growth of the fruits, but decayed spots did not develop until the fruit was ripe.

No data could be obtained on the control of the root rot of cotton caused by *Fusarium moniliforme* [*Gibberella moniliformis*: loc. cit] as the fungus was so abundant that plants from treated and untreated seed alike showed 100 per cent. infection.

To obtain information as to the value of seed treatments and the damage caused by seed-borne diseases of cotton, four brick-walled beds were prepared, the seed in each being, respectively, untreated, dusted with mercuric chloride, delinted and soaked for 30 minutes in a 1 in 1,000 solution of mercuric chloride, and

dusted with mercuric resinate. Some angular leaf spot [*Bacterium malvacearum*] subsequently appeared in the fourth bed, the organism having, apparently, blown in from a field 150 yards away. The yields of seed cotton were, respectively, 1·5, 4·47, 5·6, and 3·97 lb.

During May, 1929, halo blight (*Bact. medicaginis* var *phaseolicola*) was very severe on string beans [*Phaseolus vulgaris*] and Lima beans [*P. lunatus*]. As it was considered that the disease might have spread from kudzu plants [*Pueraria hirsuta*] in the vicinity, which were affected with the very similar halo spot [*Bact. puerariae*], cross-inoculations and a comparison of the two organisms were made. It was established that they are identical [see above, p. 424].

No resting spores of *Pseudoperonospora cubensis* causing downy mildew of Cucurbitaceae [ibid., ix, p. 362] were found, and further evidence was obtained that the main source of spring infection in Georgia is the winter cucumber crop in Florida. The spores appear to be wind-borne, the disease spreading northward each spring by this means. Very good control on cantaloupes was again given by copper acetate (⅓–50) in spite of its poor adhesion.

Toro (R. A.). **Colombia (Republic of); crop diseases and pests.**—*Internat. Bull. of Plant Protect.*, iv, 1, pp. 3–4, 1930.

This report contains the following reports of crop diseases of interest observed during 1927–8 and not already noticed from other sources. In addition to coffee, *Borreria levis*, *Galinsoga caracasana*, and *Saracha jaltomata* are hosts of *Omphalia flavida* [*R.A.M.*, ix, p. 63], which is particularly prevalent under heavy shade.

Certain cases of sugar-cane root rot have been found to be due to *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., ix, p. 340].

About 99 per cent. of the tobacco in Antioquia is infected with 'matizado' [mottling], a disease of obscure origin.

The two chief diseases of coco-nut palms observed in the Island of San Andrés were 'marchitez amarilla' [yellow wilt], probably of physiological origin, and 'hoja pequeña' [little leaf: ibid., viii, p. 356]. The former disease is prevalent in districts with an inadequate water supply; a certain number of the roots of affected palms are killed, possibly by a species of *Rhizoctonia* which was found to be present. Little leaf is found principally along roads and on isolated palms; no pathogenic organism has yet been found associated with this condition. *Capnodium* sp. and *Pestalozzia palmarum* are abundant on withered leaves.

Cacao in the Zarzal Caldas region is attacked by three important fungi, viz., a species of *Monilia* (probably identical with that occurring in Ecuador) [ibid.. vii, p. 230], *Lasiodiplodia* [*Botryodiplodia*] *theobromae*, and *Colletotrichum* sp. *Phytophthora faberi* [*P. palmivora*: ibid., ix, pp. 165, 166] causes a rot of cacao pods in Antioquia.

Witch broom control 1929. Progress report (December).—*Proc. Agric. Soc. Trinidad and Tobago*, xxx, 1, pp. 15–16, 1930.

During December, 1929, 541 Trinidad cacao plantations, with an

area of 27,835 acres, were inspected, of which 114 showed no sign of witches' broom [*Marasmius perniciosus*: *R.A.M.*, viii, pp. 160, 488], and 74 were new infections. The general decrease in the number of brooms in all the affected areas is stated to continue. On one farm, out of 24,700 trees, 22·8 per cent. were affected in December, 1928, as compared with 21·7 per cent. a year later. By the end of December 1929, 849 properties, with an area of approximately 44,004 acres, were known to be affected.

WATERHOUSE (W. L.). **Australian rust studies. I.**—*Proc. Linn. Soc. New South Wales*, liv, 5, pp. 615–680, 4 pl., 1929.

This is a detailed report of the results so far obtained in the author's investigation, started in 1921, of the rusts that occur in Australia on cereals and certain grasses, with particular reference to stem rusts. The view formerly entertained that the Australian forms of stem rust of wheat (*Puccinia graminis tritici*) have lost their power of attacking the barberry (on which they have not been found in nature) was further disproved [*R.A.M.*, viii, p. 708] by numerous successful infections with teleutospores collected in Australia, with the exception of form 43, which consistently gave negative results. Further evidence was obtained that a change in specialization of a rust may be brought about in the aecidial stage on the barberry; uredospore cultures obtained from aecidiospores produced on barberry inoculated with form 45 differed from the stock culture of this form in being able to infect Kanred (infection type 2) and in having narrower spores.

The teleutospores were found to germinate much sooner after their formation than was formerly supposed. The most abundant germination occurs about October [after the Australian winter], but sparse germination has been found as early as March, after which it continues sporadically. It ceases altogether in November. No marked difference was noted in the germination capacity of teleutospores of different physiologic forms of the rust.

Specialization studies with uredospores indicated the necessity of constantly checking and maintaining the purity of the varieties of cereals used as differential hosts, and also showed that variations in environmental conditions may profoundly influence the reactions of the hosts to the rusts. In *P. graminis tritici* the changes on several differential hosts ranged from complete susceptibility in the hotter to complete resistance in the cooler months, but some physiologic forms appeared to be more sensitive than others to variations of environmental conditions. The same change was also noted in *P. graminis avenae* on 'Joanette' oats, and changes were brought about in the reactions of some varieties of wheat and barley to *P. triticina* and *P. simplex* [*P. anomala*], respectively, by varying the environmental conditions. These results show the imperativeness of maintaining identical conditions of cultivation in the work of sorting physiologic forms on the basis of their reactions on selected hosts.

The investigation of the distribution in time and space of the physiologic forms of *P. graminis tritici* that occur naturally in Australasia showed the presence there prior to 1926 of the forms 43, 44, 45, 54, and 55; in 1926 form 34 was found in Western

Australia, and in 1927 it appeared in the Eastern States; at the present time form 34 would seem to be the only one which occurs in Australasia, since no collection of the other forms was made in 1929. The rust was found to be present in the viable uredospore stage on volunteer wheat and other graminaceous hosts, such as barley, rye, *Hordeum murinum*, *Agropyron scabrum*, and some other grasses, throughout the year. Similar studies have shown the presence in Australasia of forms 1, 2, 3, 6, and 7 of *P. graminis avenae* on oats, which also occurs on some grasses, among which *Festuca bromoides*, *Phalaris minor*, and *Hordeum murinum* are stated to be the most important. Studies of the specialization of *P. triticina* indicated that the differential hosts used by Mains and Jackson [ibid., v, p. 477] do not differentiate the two Australian forms of this rust on wheat, but this may be readily done with Farrer's Thew wheat.

Popp (W.). **Rust epidemiology.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 53–57, 1929. [Received May, 1930.]

The results of field surveys [details of which are given] in Western Canada during the summer of 1928 showed that stem rust (*Puccinia graminis*) was much less prevalent on wheat than in 1927, although weather conditions were equally, if not more favourable [*R.A.M.*, viii, p. 360]. The first trace of infection was detected at Winnipeg on 9th July, three days later than in the preceding year, while in south-eastern Saskatchewan the disease did not appear until 20th July. An interesting feature of the rust development in 1928 was the occurrence of heavily rusted patches, probably due to early arriving spores, in a few scattered localities both of Manitoba and Saskatchewan; these centres were not, however, sufficiently numerous to coalesce and give rise to an epidemic. The relative mildness of the attack of stem rust in 1928 as compared with 1927 is attributed in part to the uniform development and early maturity of the crop (following on a fine spell in early August), and also to the smaller amount of initial inoculum, which had no time to multiply before the wheat was ripe enough to escape infection.

An analysis of the outcome of stationary slide exposures [loc. cit.] denoted that two factors were responsible for the scarcity of spores (only about one-sixth to one-eighth of the 1927 numbers) present during the early summer of 1928 in Western Canada. One was the very limited development of rust in the States lying to the south [cf. ibid., ix, p. 233]; and the other was the frequent rains which washed the air more or less free of spores and kept the plants wet for long intervals, thereby preventing the ready dislodgement of the spores from the pustules and their conveyance by air currents.

The results of slide exposures made during routine aeroplane flights in Manitoba and Alberta confirm those of previous years, inasmuch as they indicated the probability of the transmission of the rust spores by air currents for long distances (several hundred miles in one case) from their place of origin. It was further shown that there were only about one-eighth as many spores

floating in the air in the northern regions during 1928 as in the previous year, thus supporting the evidence of the stationary slides.

GREANEY (F. J.). **Sulphur dusting experiments for the control of cereal rusts.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 61–77, 1929. [Received May, 1930.]

Full details, accompanied by tables, are given of the sulphur dusting experiments for the control of the cereal rusts (*Puccinia* spp.) in Western Canada in 1928 [*R.A.M.*, vii, p. 565]. Owing to the relative mildness of stem rust (*P. graminis*) on wheat [see preceding abstract], no definite conclusion as to the efficacy of the treatment could be reached, but the results, as far as they go, may be considered encouraging. The feasibility and utility of aeroplane dusting were again demonstrated. Further evidence was obtained of the value of potassium permanganate (2 per cent.) in enhancing the toxicity of kolodust.

ROUSSAKOFF (L. F.) & SHITIKOVA [-ROUSSAKOVA] (Mme A. A.). Ржавчина хлебов на Западно-Сибирской (Омской) Областной Сел.-Хоз. станции в **1928** году. [Cereal rusts at the West Siberian (Omsk) Regional Agric. Exper. Station in 1928.]—*Материалы по Микол. и Фитопатол.* [*Materials for Mycol. and Phytopath.*], Leningrad, viii, 1, pp. 1–100, 6 figs., 3 graphs, 1929.

This is a full account of the authors' investigation of the incidence and development in 1928 of the rusts of rye, wheat, and oats in Western Siberia, some results of which concerning spring wheats have been given in a previous paper [*R.A.M.*, viii, p. 709]. Owing to the climatic peculiarities of the foregoing winter only three rusts attained considerable development in that year, namely, the brown rusts of wheat and rye (*Puccinia triticina* and *P. dispersa* [*P. secalina*]) and crown rust of oats (*P. coronifera*) [*P. lolii*]. In places where the snow cover accumulated to any depth and persisted throughout the winter, both wheat and rye survived well and were found in the spring to bear numerous pustules of the two brown rusts, which served as infection foci. In open spaces the rye rust alone survived in a few cases. The crops sown early in the autumn suffered most from the winter conditions, and correspondingly showed much less overwintered rust in the spring than those that were sown later. The authors consider that a check to the spring renewal of the rusts would be given by the total abandonment of winter wheat and rye or the re-ploughing just before the winter frosts of all the fields that showed any considerable amount of rust in the autumn. This is particularly true of the rye rust, as there was evidence that this rust does not spread over wide distances, like the wheat rust, and is wholly dependent on local foci of infection for its distribution in the spring. The observations also indicated that the over-wintering of the rusts is greatly influenced by cultural methods, as the most vigorous stands bearing the largest amount of infection in the spring were found in fields sown broadcast instead of in

rows, and the least in fields fertilized with stable manure and kept under clean fallow before sowing. Crops raised from peasant-grown seed-grain were more heavily infected that those raised from seed supplied by the Agricultural Station.

In regard to crown rust of oats, it was found that the disease was most prevalent and severe in the immediate vicinity of *Rhamnus cathartica* bearing its alternate stage, and the eradication of this plant is strongly recommended.

The paper also contains a detailed description, mostly in the form of tables, of the gradual development of the three rusts investigated throughout the season. A small series of experiments showed that dusting rye and wheat with sulphur somewhat reduced the severity of the rusts and helped towards preserving the green colour of the leaves over a longer period. Observations with aeroscopes indicated that the largest number of spores carried by wind were of *P. triticina*, followed by *P. secalina*, *P. lolii* being but feebly represented.

The highest degree of resistance to *P. triticina* was shown by the varieties *caesium* 0111, *albidum* 721, Kitchener, and Garnet, among the soft wheats, and by *hordeiforme* 010 among the hard wheats. All local West Siberian wheats are late maturing, and as such liable to considerable losses from this rust.

ROUSSAKOFF (L. F.). Ржавчина хлебов на Ростово-Нахичеванской Сел.-Хоз. Оп. Станции в **1927** году. [Cereal rusts at the Rostoff-Nakhitchevan Agric. Exper. Stat. in 1927.]—*Северо-Кавказская Краевая Сел.-Хоз. Оп. Станция.* [*North Caucasus Regional Agric. Exper. Station*], Rostoff-on-Don, *Bull.* 288, 24 pp., 1929.

In this paper the author gives notes on the seasonal development in 1927 of the brown rusts of wheat (*Puccinia triticina*) and rye (*P. dispersa*) [*P. secalina*] in the Rostoff-Nakhitchevan region of North Caucasus [cf. *R.A.M.*, viii, p. 763]; no other cereal rusts developed in the region, owing to the exceptionally dry spring and summer. Both rusts appeared soon after the autumn-sown crops restarted their vegetation in the spring, especially in fields where the rye and wheat had best withstood the winter period. The wheat rust developed most slowly at first, but increased rapidly towards the end of May, following two heavy rains in the middle of that month. In general, owing to the dry season in 1927, the rusts did relatively little damage. All hard wheats, and Marquis and Kitchener among the soft ones, showed a high degree of resistance; among the late-maturing varieties Co-operatorka was exceptionally resistant.

An experiment made to establish the effect of the desiccation of wheat leaves on the weight of the grain showed that by cutting one green leaf from a healthy plant 15 days prior to the normal date of its death, the absolute weight of the grain was reduced by 10 per cent. In another (greenhouse) experiment, it was found that by infecting healthy wheat plants with *P. triticina* 4 and 6 days before the milky maturity stage of the grain, the absolute weight of the mature grain was reduced by about 18 per cent.

ROUSSAKOFF (L. F.). Характеристика селекционных сортов Ячменя, Пшеницы и Овса на стойкость их к различным видам ржавчины. [The characterization of selected varieties of Barley, Wheat, and Oats, by their resistance to different species of rust.]—Pamphlet issued by *Ставрополь-Кавказская Сел.-Хоз. Оп. Станция.* [*Stavropol-Caucasus Agric. Exper. Stat.*], Stavropol, 15 pp., 1929.

This is an attempt, based on Shitikova-Roussakova's observations of the incidence and development in 1927 of cereal rusts in the western and eastern fields of the Stavropol Agricultural Experimental Station [*R.A.M.*, viii, p. 706], to class the selected varieties of barley, wheat, and oats grown at the Station by their rust reaction in that year. The study was conducted on the same lines as described by the author in a previous paper [ibid., viii, p. 762] and showed that, as a class, early-maturing varieties of barley were less damaged by brown rust (*Puccinia simplex*) [*P. anomala*] than the later ones. This was the only rust that severely attacked barley in 1927, and the following varieties exhibited the greatest degree of resistance or tolerance to it, namely: Zolotoy [Golden], Nutans 254, Paral. amer., Goly [? Awnless] 155, Coeleste, and Pall. 65/72. Yellow rust (*P. glumarum*) was mild, but attacked most severely Nutans 254 and Hanna.

The highest degree of resistance to crown rust (*P. coronifera*) [*P. lolii*] of oats was noted in the varieties Dippe, Pobieda svalefskaya, Minota, Mestny [Local], and Zolotoy Dojd [Golden Rain], and to stem rust (*P. graminis* f. *avenae*) in the varieties Ligovo, Minota, and Pobieda svalefskaya; among these varieties Pobedia svalefskaya and Minota were outstanding for their resistance to both rusts.

Among spring-sown wheats the majority of hard wheats showed high resistance to brown rust (*P. triticina*), especially *melanopus* 69, *leucurum* 51, and *reichenbachi* 862. Of the soft wheats Marquis and in part *albidum* 721 also exhibited a high degree of resistance. All autumn-sown varieties were very severely attacked by this rust, but the following suffered least: *erythrospermum* 625, *nigroaristatum* 91, Zemka, *nigroaristatum* 622, and *erythrospermum* 148.

ARRHENIUS (O.). **Berberisbuskens förekomst i s. Stockholms län.** [The distribution of the Barberry bush in the southern Stockholm district.]—*Landtmannen*, xiii, 5, p. 83, 1 map, 1930.

The distribution of the common barberry in the southern Stockholm district is shown by means of a map, and attention is drawn to the importance of such surveys in the campaign for the eradication of the barberry against stem rust of cereals [*Puccinia graminis*: *R.A.M.*, vi, p. 282].

HASSEBRAUK (K.). **Über die Abhängigkeit der Rostinfektion von der Mineralsalzernährung der Getreidepflanze.** [On the dependence of rust infection on the mineral salt nutrition of the cereal plant.]—*Angew. Bot.*, xii, 1, pp. 23–35, 1930.

The influence of varying concentrations of different mineral salts on the incidence of brown rust (*Puccinia triticina*) [*R.A.M.*, vi,

p. 570] was tested on some susceptible wheat varieties and a semi-resistant one (v. Rümker's Early Summer Dickkopf) [ibid., viii, p. 555]. The plants were grown in flasks containing nutrient-free quartz sand, to which calcium nitrate, potassium sulphate, and sodium phosphate, alone or in combination, were added in varying concentrations, taking as a standard Bruch's Poppelsdorf nutrient solution added at 80 per cent. of the water-holding capacity of the sand. Fresh uredospores in a 0·1 per cent. agar solution were brushed on to the seedlings when the first leaf reached a length of 10 cm. Both in the susceptible and semi-resistant varieties the degree of resistance to brown rust was increased by the entire omission of nitrogen from the nutrient solution, while the presence even of minute quantities of calcium nitrate led to a decline of this resistance. Excessive applications of this substance (five times the standard) failed to induce any modification in the type of infection in susceptible varieties, whereas in the semi-resistant one they caused an increase of susceptibility. Complete lack of potash proved so injurious to the leaves both of the susceptible and semi-resistant varieties that they could scarcely be used in the rust infection tests. The type of infection was not appreciably modified, in the susceptible varieties, by the different concentrations of potassium sulphate (from deficiency to excess), whereas in the semi-resistant one the alterations were pronounced. The application of only one-twentieth of the standard quantity resulted in the most striking modification of the type of infection observed in any of the tests, all the plants thus treated showing the barely perceptible chlorosis and dense pustule development of the infection type 4 (susceptible to highly susceptible). With increased applications of potash the resistance of the plants is gradually augmented, until with an excess over the normal they show a reaction approximating to that of type 1–2 (highly resistant). No definite conclusion could be reached as to the influence of phosphate on the incidence of brown rust. It would appear, however, from the behaviour of the semi-resistant variety, that a deficiency of phosphate leads to increased susceptibility, while an excess augments resistance.

In another series of experiments wheat plants of the same varieties as those used in the above tests, supplemented by the highly resistant Swedish Aurore and Halland, were inoculated with *P. triticina*, kept under a bell-jar for three days, and then placed head downwards in solutions of mineral salts (1/32 mol.) and left overnight. The plants were grown in ordinary garden soil or in soil deficient in the substance to be tested. The following salts were used to test the influence of nitrogen: potassium nitrate, sodium nitrate, magnesium nitrate, manganese nitrate, calcium nitrate, ammonium nitrate, ammonium sulphate, ammonium phosphate, and ammonium chloride, together with the organic compounds asparagin and glycocol. A marked decline in the resistance of the semi-susceptible v. Rümker's Dickkopf was the result of immersion in ammonium nitrate, ammonium sulphate, ammonium chloride, glycocol, and asparagin, the effects of ammonium phosphate and calcium nitrate were slighter, and those of potassium nitrate and sodium nitrate negligible. The same

variety also proved most useful in determining the action of the potash salts, viz., potassium chloride, potassium sulphate, potassium bromide, potassium bicarbonate, and primary, secondary, and tertiary potassium phosphate, of which potassium bicarbonate and secondary potassium phosphate were the most effective in producing increased resistance. A slight increase of resistance in this variety was also conferred by sodium phosphate. As in the former series of tests, the effects of the treatment were less apparent in the highly susceptible varieties, and also in the very resistant Aurore and Halland.

Bodnár (J.) & Terényi (A.). **Biochemie der Brandkrankheiten der Getreidearten. II. Mitteilung. Biophysikalische und biochemische Untersuchungen über die Kupferadsorption der Weizensteinbrandsporen (Tilletia tritici [Bjerk.] Winter).** [Biochemistry of the smut diseases of cereals. Note II. Biophysical and biochemical investigations on the copper adsorption of the Wheat bunt spores (*Tilletia tritici* [Bjerk.] Winter).]—*Hoppe-Seyler's Zeitschr. für Physiol. Chem.*, clxxxvi, 4–5–6, pp. 157–182, 4 graphs, 1930.

A comprehensive account is given of the writers' investigations on the adsorption of copper by the spores of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, vi, p. 410].

It was found that the copper adsorbed by the spores from copper sulphate is exchangeable to the extent of 55 and 45 per cent., respectively, with the hydrogen and metal ions diffused by the spores. With increasing concentrations and protracted periods of steeping, the spores were found to adsorb 51 to 133 per cent. more copper from copper acetate, and 115 to 229 per cent. more from copper ammonium sulphate, than from copper sulphate. The absolute and relative copper adsorption values of copper sulphate, copper acetate, and copper oxide ammonia are approximately in the ratio of 1 : 2 : 3.

Steeping in solutions of the copper salts $CuSO_4$, $CuCl_2$, $Cu(NO_3)_2$, $Cu(C_2H_3O_2)_2$, does not kill the bunt spores, which germinate if subsequently sown in a $Ca(NO_3)_2$ solution or in damp soil after treatment with hydrochloric acid. Evidently, therefore, the latter substance and soil moisture wash away the copper adsorbed by the spore walls in the form of albuminous copper compounds and copper phosphate. On the other hand, spores steeped in copper ammonium sulphate are incapable of germination even in damp soil or after treatment with hydrochloric acid, since the complex ion in this substance, $Cu(NH_3)_4^{\cdot\cdot}$, unlike the simple $Cu^{\cdot\cdot}$ ion, penetrates into the interior of the spores and destroys them. Spores containing less than 0·5 per cent. adsorbed copper germinated without the aid of hydrochloric acid or damp soil.

It was not possible to enhance the efficacy of the copper sulphate treatment by the admixture of zinc sulphate or common salt.

Niethammer (Anneliese). **Die Dosis tolerata und toxica der Beizmittel als eine Komponente der physikochemischen Struktur des Samenkornes.** [The *dosis tolerata* and *toxica*

of the disinfectant as a component of the physico-chemical structure of the seed-grain.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 1–2, pp. 44–50, 1930.

Further investigations on the nature of the action exerted by some standard liquid disinfectants (uspulun-universal, ostan, and germisan) on the seed-grain of wheat and rye confirmed the results of previous experiments, which showed that the quantities of mercury absorbed by the seed-coat are infinitesimal, while the embryo is not reached at all [*R.A.M.*, ix, p. 236]. There can be no question, therefore, of any injury to the seed-grain as a result of treatment with these preparations. On the other hand, concentrations which are harmless to Gramineae have been found in Holland to damage lettuce seed; peas are also liable to injury from the absorption of mercury (*Beih. Bot. Centralbl.*, xlvi, 1926). These seeds do not possess the semi-permeable character of the Gramineae and hence the *dosis toxica* in such cases lies at a lower concentration.

Conners (I. L.). **Smut investigations.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 86–90, 1929. [Received May, 1930.]

The most striking fact elicited by a survey of the prevalence of wheat bunt (*Tilletia tritici*) [*T. caries*] in the Prairie Provinces of Canada during 1928 was the high incidence of the disease in the durum varieties. About 5 per cent. of all the durum wheat produced in 1927 and 1928 was graded smutty, and 75 per cent. of the crop showed at least traces of infection. The best control of the disease was given by four hours' immersion of the seed-grain in a formalin solution. Copper carbonate dust, which gives very satisfactory control of bunt in common wheat, was found to be less successful for the durums. Formalin (spraying, sprinkling, or steeping) was also most efficacious against covered smut of oats [*Ustilago kolleri*]. Covered smut of barley [*U. hordei*] was also completely controlled by the formalin steep, as well as by Du Pont No. 12 and agfa dusts.

Schafer (E. G.). **Division of Agronomy.**—*Thirty-ninth Ann. Rept. Washington Agric. Exper. Stat. for the Fiscal year ended June 30, 1929* (*Bull.* 237), pp. 13–19, 1929.

This report contains the following items of phytopathological interest. In 1928 E. F. Gaines and W. K. Smith inoculated ten winter and ten spring wheats with five different collections of *Tilletia levis* [*T. foetens*], which were found to comprise three distinct forms and two mixtures each comprising two other forms. These were isolated and all seven forms tested in 1929. One form was found to be virulent on all the ten winter wheats and less so on the spring ones. Turkey was resistant to two forms, but susceptible to the other five (62 and 86 per cent. infection). Martin was immune from two forms, intermediate to one, and susceptible to the remainder. Hussar was immune from three forms, but produced 25 to 45 per cent. smutted heads on inoculation with each of the others. Albit was immune from two forms but susceptible to five. Ridit, Oro, and Hohenheimer were immune from, or

highly resistant to all the forms. Hope was susceptible to all the forms when sown in the autumn, but immune from all when sown in the spring. Jenkin was susceptible to three forms and intermediate to the other four. Six of the spring wheats were highly resistant to all seven forms (0 to 5 per cent. infection).

A special study was made of the resistance of wheat to a highly virulent form of *T. foetens* found in eastern Washington. More than 100 varieties and hybrid winter wheats selected for immunity from another form proved very susceptible to this one, producing 50 to 90 per cent. diseased heads. Ridit, Hohenheimer, and a recent Turkey selection, however, remained free from infection, as also did four hybrid selections containing Ridit 'blood'. Two wheats recently introduced from Russia and two from Germany were also highly resistant to this form. Of the spring wheats, Marquis was the only common variety showing a high degree of resistance, but 75 others, mostly hybrids and new introductions from Russia and North China, developed less than 5 per cent. infection.

Briggs (F. N.). **Factors which modify the resistance of Wheat to bunt, Tilletia tritici.**—*Hilgardia*, iv, 7, pp. 175–184, 1929.

Continuing his studies [*R.A.M.*, v, p. 726] of the inheritance in wheat of resistance to bunt (*Tilletia tritici*) [*T. caries*], the author gives details of experiments which were conducted from 1925 to 1928, inclusive, at the Davis University Farm, California, to determine whether the occurrence of a few bunted plants in a row of a resistant pure line is due to the fact that genetically resistant plants may occasionally become infected, or to the presence of modifying factors within the plants. The material used consisted of selections from the F_4 and subsequent generations of a cross of Hussar with Hard Federation wheats inoculated with a bunt collection from Little Club wheat kept going on White Federation since 1919. The results [presented in tables] are interpreted as indicating the presence of factors which modify the resistance of wheat to bunt, a fact which is considered to render possible a more complete understanding of the results obtained when a bunt-resistant wheat is crossed with a susceptible one, and also to offer a possible partial explanation of the variability observed in rows of other genotypes. Although there is no doubt that a considerable part of the variation exhibited by heterozygous and homozygous susceptible F_3 rows in the percentage of bunted plants is due to environmental influences, a part appears to be due to modifying factors.

Bates (E. N.), Bodnar (G. P.), & Baldwin (R. L.). **Removing smut from Pacific Northwest Wheat by washing.**—*U.S. Dept. of Agric. Circ.* 81, 24 pp., 5 figs., 1 graph, 1929.

In giving a brief description of the methods in use in the Pacific Northwest region of the United States for freeing wheat grain destined for export or for milling from bunt spores [*Tilletia caries* and *T. foetens*], the authors emphasize the superiority of the one-cylinder grain washer over the two-cylinder machine which gives

an unnecessarily severe treatment to the grain and seriously impairs its appearance. Following these experiments, a one-cylinder washing equipment was installed at a municipal elevator in Portland, Oregon, the working of which was examined by the Department of Agriculture to determine the cost of operation and the effectiveness with which bunt spores were removed. The investigation was carried out from the 9th to the 27th September, 1924, during which period a total of 5,294 tons of wheat was washed; the outlay for labour amounted to 7·65 cents per ton and the power and water used in the process brought the total cost to 12·13 cents, not including overhead charges. The fees charged at the elevator vary with the officially assessed percentage of contamination of the wheat with bunt spores, and range from 35 cents per ton for a contamination of 0·5 to 3 per cent. to 75 cents for one of 7·5 to 15 per cent., inclusive.

The total quantity of wheat treated contained 0·236 per cent. by weight of actual bunt spores before washing, an average of 86·9 per cent. of which was removed by the treatment. The percentage of other foreign bodies was reduced from 0·47 to 0·36. The average moisture content of the wheat was increased by 2·14 per cent. by the washing, and was so small as to indicate that artificial drying of the treated grain is seldom, if ever, necessary for wheat grown in the Pacific coast region. The gain in absolute weight of the wheat after treatment was 2·60 per cent. Calculations showed that the treatment gave an average increased profit of 81·8 cents per ton.

SIMMONDS (P. M.). **Report of the Dominion Field Laboratory of Plant Pathology, Saskatoon, Sask., in co-operation with the University of Saskatchewan, Saskatoon.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 91–107, 5 figs., 1929. [Received May, 1930.]

An account of the author's work on the cereal foot rot problem in Saskatchewan during 1928 is given. Tests of *Fusarium culmorum* and *F. orthoceras* var. *longius* on wheat and oats indicated that the former readily invaded the roots and in many cases prevented the emergence of the seedlings [*R.A.M.*, viii, p. 373], whereas the latter was not pathogenic. Oats were more severely injured by *F. culmorum* than wheat.

The best control of *Helminthosporium sativum* on Marquis wheat was given by Dupont No. 12 dust. The results of inoculation tests made by spraying the plants with a spore suspension and keeping in a moist chamber for 24 hours showed that the chief damage caused by this fungus to the mature kernel takes place when infection occurs during flowering. *H. sativum* was found to be very frequently present on wheat seed-grain, and it is thought that the sowing of diseased seed may assist in the spread of infection.

Mature perithecia of *Ophiobolus graminis* [ibid., viii, p. 370] were produced on oat hull mash cultures, which had been placed outside for eight days and exposed to freezing temperatures during the night. Six isolations of *O. graminis* showed a marked and fairly consistent difference in virulence, the highest degree of

infection being produced by a strain from Kansas (94 per cent.) and the lowest by an Australian one (27 per cent.). One strain from Saskatchewan caused 91 per cent. infection and another 55 per cent., while two further isolations (from New York and Australia, respectively), produced 55 and 31 per cent. A further experiment showed that the incidence of the pre-emergence and seedling blight due to this fungus increased in proportion to the depth of sowing. Sixty-five per cent. of all the plants which emerged were killed as a result of field inoculations with the more virulent of the two Saskatchewan strains of *O. graminis*. Crop rotation (breaking, wheat, oats, wheat, summer fallow) appears to be the most practical method of controlling take-all.

Nicolas (G.) & Aggéry (Mlle.). **Une attaque intense d'Helminthosporiose de l'Escourgeon dans la Haute-Garonne en 1929.** [An intense attack of helminthosporiosis on winter Barley in Haute-Garonne in 1929.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 1, pp. 6–8, 1930.

Attempts made over several years in the vicinity of Toulouse to acclimatize north African winter barley have had to be abandoned owing to the susceptibility of the plants to a *Helminthosporium*, thought to be *H. teres*, which caused a blackish leaf spot. The ears apparently remained normal, but produced poor grain.

In June, 1929, one of the authors noted in the same locality a winter barley plant of unknown origin very severely attacked by *H. gramineum* [cf. *R.A.M.*, ix, p. 30]. The leaves were withered and showed characteristic long lesions bearing conidia which measured 60 to 95 by 16 to 18 μ; the ears were dried up and brownish-black; the glumes bore brown spots, which were also present on the stem at the base of the ear. Mycelium was present in the tissues of the stem and palea and the outside of the grain was also spotted. The yield was almost nil.

Hülsenberg (H.). **Das Auftreten der Weissährigkeit bei Roggen in Mitteldeutschland in den Jahren 1928 und 1929, bewirkt durch Leptosphaeria herpotrichoides de Not.** [The occurrence of 'white ear' of Rye in central Germany, caused by *Leptosphaeria herpotrichoides* de Not., in the years 1928 and 1929.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 1–2, pp. 11–25, 1 fig., 1930.

Considerable economic importance attaches to 'white ear' of rye (*Leptosphaeria herpotrichoides*) in Germany [*R.A.M.*, viii, p. 437]. The climatic conditions predisposing the rye crop to infection by this fungus have been found to be quite different from those conducing to the similar disease of wheat caused by *Ophiobolus herpotrichus* [ibid., ix, p. 172]. White ear of rye appears to be favoured by comparatively dry and very cold weather, whereas wheat suffers most in wet seasons. On the former crop the disease is most prevalent, according to the writer's observations in Saxony, on very light soils, while on the latter it is found mainly on cold, stiff ground. White ear of rye was shown, by colorimetric and electrometric examinations of soil samples [the results of which are tabulated], to occur exclusively on soils with a marked acid reac-

tion. The disease was further found to be practically confined to fields in which rye followed rye, so that an important control measure consists in rotation with some such crop as seed lupins, serradella [*Ornithopus sativus*: ibid., iii, p. 230], or potatoes. The rye crop should be well supplied with phosphoric acid, while lime is also essential to counteract the acidity of the soil.

ALEXEYEFF (A. M.). Влияние супрамаксимальных температур на споры головни Проса. [Effect of super-maximum temperatures on the spores of Millet smut.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January, 1928*], p. 169, 1928. [Received April, 1930.]

Experiments in which millet [*Panicum miliaceum*] smut spores (*Ustilago panici-miliacei*) were heated in water for various periods at temperatures ranging from 50° to 65° C., showed that up to 60 per cent. germination may be obtained even at a temperature as high at 65° by correspondingly shortening the time of exposure of the spores to heat. The treatment, however, considerably delayed the rapidity of germination and increased the time needed for the germination of all the spores that had retained their viability. The interdependence of the energy of germination and the length of exposure at each temperature can be expressed by a sigmoid curve, the empirical formula of which could not be established, but which appears to be highly complicated [cf. *R.A.M.*, iii, p. 536].

DOIDGE (ETHEL M.). **Some diseases of Citrus prevalent in South Africa.**—*South African Journ. of Sci.*, xxvi, pp. 320–325, 1929.

In this account of some of the diseases and blemishes responsible for wastage in citrus fruit exported from South Africa [cf. *R.A.M.*, viii, p. 774], the author describes experiments in the soaking of citrus fruits in borax or sodium carbonate and also in the less expensive method of wrapping the fruit in paper impregnated with these two substances, with a view to preventing the decay due to *Penicillium digitatum* and *P. italicum* [ibid., vii, p. 576]. In 1928, 200 cases of Valencia oranges were arranged in 4 lots of 25 cases, each lot receiving one of the four treatments, 4 lots of 25 cases of untreated fruit in ordinary wrappers being kept as controls under conditions closely resembling those to which export fruit is subjected. All were atomized with a suspension of mould spores; as summer heat prevailed at the end of the storage period the test was unusually severe. Subsequently, only 6·37 per cent. *Alternaria* stem end rot was found present in the fruit wrapped in paper impregnated with sodium bicarbonate as compared with 13·61 per cent. infection in the untreated control; the corresponding figures for the borax-treated paper were 9·12 and 23·78 per cent., respectively. The best results against the *Penicillium* moulds were given in the lot treated by dipping in a 5 per cent. solution of sodium carbonate, this giving only 1·2 per cent. decay, as compared with 6·9 per cent. decay in the corresponding untreated controls.

Black rot (*Diplodia natalensis*) and brown rot, the latter of which is so infrequent in South Africa that no opportunity has yet arisen to determine whether the causal organism is *Pythiacystis* [*Phytophthora*] *citrophthora* or the *Phytophthora* prevalent in Australia [*P. hibernalis*: ibid., ix, p. 105], appear to cause trouble only in those rare seasons when late rains have continued far into the autumn. In 1925 sour rot (*Oospora citri-aurantii*) was associated with the brown rot.

In the more humid areas of the Northern Transvaal much superficial disfiguration of citrus fruits is caused by the sooty blotch attributed to *Leptothyrium pomi*. A black spot due to *Phoma citricarpa* (reported for the first time in South Africa) was noted in the vicinity of Pietermaritzburg; hitherto this fungus has been recorded only in China and Australia [ibid., iii, p. 646; cf. also an Argentine record in ibid., viii, p. 268]. *Colletotrichum gloeosporioides* occurs commonly on dead twigs in citrus orchards in South Africa. Usually, it attacks the fruit through insect punctures or abrasions of the rind. The stem-end rot described by Fawcett as due to the same fungus is uncommon in South Africa. In the Eastern Transvaal and Natal a rather extensive blemishing of grapefruit was noted, due to anthracnose tear staining resulting from the superficial growth of this fungus on the unbroken rind; it appeared as if formed by drops of dew running over the surface and leaving infection in their track.

The causes predisposing citrus in South Africa to the very serious spotting known as oleocellosis have not yet been ascertained; the condition results from the action of oil liberated from glands on the rind. The affection of young trees and nursery stock known as concentric ring blotch [ibid., v, p. 487] often causes a very similar blemish on the fruit of trees just coming into bearing, distinguishable from oleocellosis only in not having the faint concentric zonation. On the leaves of young trees, generally on the upper side, ring blotch produces minute yellow rings, surrounding a dull green centre. Puffing and grooving of the rind, attributed to the effects of drought, is also a serious cause of breakdown in citrus fruit.

McCleery (F. C.). **Lemon scab and its control.**—*Agric. Gaz. New South Wales*, xli, 1, pp. 27–30, 2 figs., 1930.

Lemon scab or verrucosis (*Sporotrichum citri*) is stated to be probably the most important disease of the crop in the coastal districts of New South Wales, where it causes considerable financial losses annually. It has been shown, however, that the disease is readily amenable to control by spraying with Bordeaux mixture and red oil as recommended in a recent paper [*R.A.M.*, ix, p. 177].

The disease is always present in a severe form (often termed rust) on rough lemon stocks in the nursery. When it attacks the leaves and stems, scab has a marked stunting effect on the seedling stocks intended for budding, the growth of which is frequently reduced by 40 or 50 per cent. Because of the continuous development of young growth in the nursery, control is more difficult than in the groves. In the latter, the young fruit are most susceptible

just at and after blossoming, but they rapidly become resistant, so that if the trees are sprayed while the fruits are still very small and are protected against infection for some weeks, there is little danger of their being attacked later in the season. It has also been noted that the fungus requires free moisture persisting for a considerable period to cause infection, and that fruits which set in dry weather often escape attack.

The Satsuma (Unshiu) orange is also very susceptible to scab, while Seville and sweet oranges and tangerines may be attacked in wet seasons. The disease has not yet been recorded on grapefruit in New South Wales.

ALDABA (V. C.). **Observations on Citrus gummosis and its methods of control in the Philippines.**—*Philipp. Agric. Rev.*, xxii, 4, pp. 345–352, 1 pl., 1929.

The author briefly indicates the preventive and control measures which in his opinion, may be effective in reducing the damage caused by, or even may completely check, gummosis and bark rot of citrus in the Philippines [*R.A.M.*, viii, p. 25]. The preventive measures include those directed to improving the general health and vigour of the trees, the usual recommendations regarding grove sanitation, and the use of resistant varieties as stocks. The curative treatment consists in cutting out the lesions on the trunks and bigger limbs, and painting the wounds, when dry, with a mixture of carbolineum and asphaltum. This mixture was found to be more effective than Bordeaux paste or lime-sulphur wash for disinfecting the surface.

THOMAS (K. M.). **Some observations on varietal resistance to 'rust' of Coffee.**—Reprinted from *Madras Agric. Journ.*, November, 1929, 7 pp., 2 pl., [1930].

A table is given setting out the prominent qualities, including the degree of resistance to *Hemileia vastatrix*, of the different varieties of coffee cultivated in Coorg [South India]. *Coffea arabica*, universally grown, is very susceptible, the bushes being heavily defoliated between June and February; *C. robusta*, which is rare, is almost immune; *C. liberica*, never cultivated on a plantation scale, is very resistant; Kent's Arabica, recently introduced but increasing in popularity, is fairly resistant; while Jackson's Hybrid, also recently introduced, appears to be as susceptible as *C. arabica*. Hall's coffee, as far as could be judged from three-year-old plants, is very resistant.

An anatomical study [some details of which are given] of the leaf of these varieties showed that in all of them numerous indiscriminately distributed, oily or waxy globules were present on the cells of the lower epidermis and in those of the leaf parenchyma. In young leaves the globules are small, numerous, and evenly distributed; as the leaves mature, some of the small globules fuse into bigger ones, two of which are generally found on each guard cell of a stoma. In the resistant varieties the small globules are much more numerous and fusion takes place at a later stage than in the susceptible varieties. A definite correlation was established between the degree of resistance to *H. vastatrix* and

the number, distribution, and period of fusion of the globules found on the lower epidermis.

That these globules were also found in the mesophyll suggests that the amount of oil or wax on the epidermis is directly related to the amount present in the cells of the parenchyma; but whether this is so or not, the amount of oil or wax on the lower epidermis appears to be a factor in determining the degree of resistance. It is considered to be possible that the oily matter renders the leaf waterproof and perhaps functions as a toxin to the promycelium in its efforts to enter the leaf, especially during the early stages of leaf development.

FAHMY (T.). **The angular leaf spot of Cotton in Egypt.**—*Empire Cotton Growing Review*, vii, 1, pp. 30–36, 3 pl., 2 graphs, 1930.

A brief account is given of a bacterial spot on the leaves and bracts of cotton which usually appears in Egypt late in the season, when the plants approach maturity. The outward symptoms are very similar to those of the angular leaf spot of cotton, and isolations from the lesions yielded an organism resembling in its cultural characters *Bacterium malvacearum* [*R.A.M.*, ix, p. 376], although in a small range of greenhouse experiments it failed to reproduce the disease in healthy plants, a failure which may have been caused by unfavourable environmental conditions.

The disease is generally of no economic importance in Egypt because the local climatic conditions do not favour its spread during the more important period of the life of the cotton plant.

DASTUR (J. F.). **Cotton wilt.**—*Mem. Dept. Agric. India, Bot. Ser.*, xvii, 3, pp. 29–73, 6 pl., 1929.

This is a detailed account of the author's study from 1923 to 1928, inclusive, of the cotton wilt disease in the Central Provinces and Berar in India, which is stated to present important points of difference from the diseases described under the same name from other cotton-growing countries and attributed to *Fusarium vasinfectum* [*R.A.M.*, ix, p. 378]. In the area mentioned the disease chiefly occurs in fields kept under cotton for several years consecutively, and on waterlogged or otherwise unsuitable soils; it has never been observed to spread from field to field or from plant to plant. The macroscopic, histological, and microchemical symptoms [a full description of which is given] are very typical, and serve to distinguish the disease from the seedling blight caused by species of *Rhizoctonia* (occasionally *Phytophthora*), which is a very common and serious trouble in this region.

Examination of a large number of wilted and healthy plants showed that the tissues of the former do not necessarily contain hyphae of species of *Fusarium*, while such byphae were at times found in healthy plants [ibid., vii, pp. 30, 492]. Applications of lime to wilt-diseased soil had no immediate or residual effect on the disease; superphosphate at the rate of not less than one ton per acre appeared to exert some residual effect in lowering its incidence, while control was afforded by large applications of uspulun, but not by small ones.

When cotton plants were grown in pots containing normal soil in the upper half and wilt-affected soil in the lower, and vice versa, wilting was first noticed in the pots with diseased soil in the upper half and appeared much later in the second series; in the latter all the plants were dead from wilt at the end of the experiment, while in the former, although all the plants had shown visible symptoms at first, some recovered when their roots reached the normal soil and remained healthy to the end of the season. A similar effect was observed when cotton seeds were sown in small pots with large drain holes containing normal soil which were embedded in larger pots with wilt-affected soil, and vice versa. In pots in which normal and diseased soil were mixed, the incidence of wilt was influenced by the proportion of diseased soil which was added to the normal, and apparently also by the size of the pots used in the experiments.

The author's inoculation experiments confirmed those of J. Singh [loc. cit.], in showing that the *Fusarium* which is commonly found in wilted cotton plants and which is present in both diseased and healthy soil, is not parasitic on cotton. On the other hand, typical wilt was produced when cotton was grown in healthy soil mixed with pieces of stems of wilted cotton plants of the previous season, but the same results, although in a lesser degree, were also obtained with healthy cotton stems; the incidence of wilt was not increased when the *Fusarium* was grown on the cotton stems before mixing them with the healthy soil. When single pieces of wilted cotton stems were planted in healthy soil next to the cotton seeds, no cases of wilt ensued. It was shown that wilt can be induced in normal soil by non-pathogenic agencies, such as by treating it with heavy doses of organic manure, with lime, or with aluminium salts, and also by keeping the soil waterlogged. The whole complex of wilt symptoms was also produced in healthy plants growing in normal soil by injecting them with aluminium salts. Plants grown in wilt-affected soil dry sterilized at 140° to 150° C. remained free from the disease, but dry sterilization of the soil at 120° did not afford control. Some degree of control was also apparently afforded by growing sorghum together with cotton. When cotton seedlings in very early stages of wilt infection were transplanted to healthy soil, they developed into healthy plants, though the *Fusarium* was occasionally found in a viable state in such plants. Experiments in which staling products of several species of *Fusarium* and other fungi were injected into cotton plants showed that the latter are susceptible to the toxic effect of these products.

It is suggested that aluminium salts are present in the tissues of wilt-affected plants and wholly or partially fill the lumen of the cells.

WIZE (K. F.). **Contribution à la flore des entomophytes de l'Ukraine.** [A contribution to the entomogenous flora of the Ukraine.]—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1655–1656, 1929.

In this account of his investigations into the entomogenous fungi of the Ukraine, the author deals especially with those parasitizing the sugar beet beetle (*Cleonus* [*Bothynoderes*] *punctiventris*). He states

that, among these, *Botrytis* [*Beauveria*] *bassiana*, *Isaria farinosa*, *I.* [*Spicaria*] *fumoso-rosea* [*R.A.M.*, ix, p. 308], *I. smilanesis* Wize, *Acremonium danyszii* Wize, *A. cleoni* Wize, *A. soropsis* Wize, *Pseudomortierella cleoni* Matruchot & Wize, *Verticillium oksanae* Matruchot & Wize, *Olpidiopsis ucrainica* Wize, and *Strumella barbarufa* Wize cannot, in his opinion, live for long, or in any remarkable profusion, in fields exposed to the sun. *Oospora destructor* [*Metarrhizium anisopliae*: ibid., vi, p. 294], *Tarichium uvella* [loc. cit.], and *Massospora cleoni* Wize are better adapted to field life, and soil infection with these fungi increases with successive crops of beets. The first named, in fields long sown to beets, destroys up to 100 per cent. of the larvae and chrysalides of *B. punctiventris*. The conidia remain viable for at least four years in soil sown to successive crops of beets attacked by the beetle.

Red muscardine (*Tarichium uvella*) contemporaneously with the green, attacks up to 60 per cent. of the larvae and chrysalides. *Massospora cleoni*, which resembles *M. cicadina* [ibid., i, p. 65], is a rare species of red muscardine, but when found is always abundant.

Strumella parasitica Sorokine and *S. barbarufa* produce tumours on the skin of the larvae, the former attacking *Polyphylla fullo*, the latter the larvae and chrysalides of *B. punctiventris*. In most cases, especially with *S. barbarufa*, the sclerotium penetrates the body of the host and kills it.

Zabłocka (Wanda). **O kilku nowych stanowiskach maczuznika (Cordyceps).** [New stations of some species of *Cordyceps*.]—*Acta Soc. Bot. Poloniae*, vi, 2, pp. 187–191, 1 pl., 1 fig., 1929. [German summary.]

This is a record of localities where the following species of *Cordyceps* are stated to have been observed for the first time. *C. pistillariaeformis* Berk. & Br. was found parasitizing scale insects (*Lecanium corni*) on branches of *Robinia pseud-acacia* in Moravia; the *Isaria* stage (*I. lecaniicola*) had already been recorded in North Poland in 1924. *C. ditmari* Quel. was found in a mixed pine wood in the neighbourhood of Cracow parasitizing *Vespa silvestris*, and *C. militaris* [*R.A.M.*, ii, p. 76] was collected in south-east Poland on larvae of *Sphinx pinastri*. A specimen of an undetermined species of *Sphinx* received by the author from Java was found to have been killed by *C. sphingum* in its well-defined *Isaria* stage.

Ashford (B. K.). **Mycology of the intestinal canal in Porto Rico and its relation to tropical sprue.**—*Journ. Amer. Med. Assoc.*, xciii, 10, pp. 762–765, 3 figs., 1 graph, 1929.

Cultures from the faeces of 872 inhabitants of Porto Rico, of whom 288 were suffering from clinical sprue, 280 showed the syndrome of nutritional unbalance of Porto Rico, 126 had other diseases, and 178 were healthy boys from a charity school at San Juan, revealed the presence of *Monilia* [*Candida*] *psilosis* [*R.A.M.*, viii, pp. 505, 506] in 263 cases and of *M.* [*C.*] *parapsilosis* in 183. The latter organism, formerly suspected of being a permanent variant of *M. psilosis*, is now considered to be a distinct species,

characterized by a consistent refusal to ferment maltose and by other cultural and morphological differences [which are briefly indicated]. *C. psilosis* was found in 52·7 per cent. of 74 cases of tropical sprue which were the subject of a particularly intensive study. *C. krusei* was found in 43 of the above-mentioned 872 cases, *Oidium* [(?) *Oospora*] *brasiliense* [ibid., ix, p. 312] in 66, and *Torula* spp. in 83 [ibid., viii, p. 676], besides a number of undetermined fungi.

As a result of his investigations, the author believes sprue to be fundamentally due to a nutritional unbalance, on which is superimposed the syndrome induced by infection with *C. psilosis*. The disease is pre-eminently an exhaustion process, frequently associated with physical or mental over-fatigue and other devitalizing conditions, especially among the well-to-do and intellectual sections of the population.

Hopkins (J. G.) & Benham (Rhoda W.). **Monilia infections of the hands and feet.**—*New York State Journ. of Med.*, xxix, 13, pp. 793–800, 4 figs., 1929.

The 'erosio interdigitalis' of Kaufmann-Wolf and Fabry and the chronic paronychia of Kumer and Shelmire are stated to be frequently associated in the same two classes of patients, namely, those whose hands are much exposed to dish water, and those engaged in handling fruit [*R.A.M.*, viii, p. 643].

The species of *Monilia* [*Candida*: ibid., viii, p. 677] isolated from these lesions has been shown to be capable of reproducing the erosio. The regularity of its presence in paronychia and the frequent association of the latter condition with erosio support the hypothesis that the two types of lesion are due to the same cause. The fungus isolated from 12 out of 14 cases was found to be indistinguishable culturally from *C. albicans* and *C. psilosis* [see preceding abstract] but slight antigenic differences were shown. Six *Monilia* strains closely resembling *C. parapsilosis* were isolated from other types of skin lesion, but in no case was definite evidence of their pathogenicity forthcoming.

Вакнтin (V. S.). Грибные вредители книг. [Fungi which damage books.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January, 1928*], pp. 169–170, 1928. [Received April, 1930.]

An investigation of the causes of the heavy deterioration noticed in recent years of the books stored at the Russian State Public Library [Leningrad] showed that the damage is mainly done by fungi which produce spots, efflorescences, and various discolorations; the leaves of the books are frequently found compacted together and the paper becomes very brittle. Isolations from several hundred samples have so far yielded the following species: *Stachybotrys lobulata*, *S. atra*, *S. alternans*, *Macrosporium consortiale*, *Sporotrichum polysporum*, *Trichoderma lignorum*, *Spicaria elegans*, *Fusarium* sp., *Myxotrichum chartarum*, *Anixia cyclospora*, *Chaetomium elatum*, *C. affine*, *C. chartarum*, and *C. bostrychodes*. The species of *Stachybotrys* are most frequently

present (up to 50 per cent. of all the samples), followed by species of *Chaetomium*.

The considerable development of fungi is believed to have been favoured by the fact that during several years the Library was not heated, this leading to a condensation of moisture on and in the books; when heating was resumed, it gave a strong impetus to the growth of the fungi, which was further promoted by insufficient ventilation of the rooms.

Bryan (Mary K.) & McWhorter (F. P.). **Bacterial blight of Poppy caused by Bacterium papavericola, sp. nov.**—*Journ. Agric. Res.*, xl, 1, pp. 1–9, 1 pl., 5 figs., 1930.

An account is given of a bacterial disease of the Shirley poppy (*Papaver rhoeas*) which was observed in 1927 at Franklin, Virginia, and which attacked all the aerial organs of the plants. On the leaves young infections appear as minute water-soaked areas which soon darken into circular, zonate spots, 3 to 4 mm. in diameter, surrounded by a hyaline or water-soaked ring. By coalescing large black or sepia-black areas may form. The lesions on the stems are intensely black and elongated and they may coalesce and girdle the stem. The causal organism enters through the stomata and may occasionally penetrate the veins from the intercellular spaces or through the water pores, in which case the disease becomes systemic, the veins darken, and the surrounding tissues turn yellow and die. All floral parts are susceptible, but the young sepals are especially so. A slimy bacterial exudate is very noticeable on the affected pods and at times appears on the leaf lesions also.

Isolations yielded a short rod, 1 to 1·7 by 0·6 to 0·7 μ, motile by means of a single poplar flagellum, occurring singly, in pairs, or in short chains. In culture it forms capsules but not spores; it is aerobic, Gram-negative, and non acid-fast. On beef agar the colonies are round and bright yellow. It grows best at a P_H value of 6·9 to 7·6, and the optimum temperature is between 25° and 30° C. The bacterium was shown to be able to withstand drying for four months on cover glasses and for 20 months or more in herbarium material. It is considered to be new to science, and is named *Bact. papavericola*.

A morphologically identical leaf spot was recorded in Connecticut by Clinton in 1909 and similar lesions were observed in 1927 on the Oriental poppy (*P. orientale*) in Virginia; the organism isolated from the latter showed slight cultural difference from the Shirley poppy strain, but when inoculated into the latter, it produced lesions characteristic of the disease.

Müllers (L.). **Pilzkrankheiten auf Chrysanthemumblättern.** [Fungous diseases of Chrysanthemum leaves.]—*Blumen- und Pflanzenbau*, xlv, 2, pp. 32–33, 3 figs., 1930.

Popular notes are given on the etiology, symptoms, and control of three destructive fungous diseases affecting chrysanthemums in Germany, viz., mildew (*Oidium chrysanthemi*) [*R.A.M.*, vi, p. 164], rust (*Puccinia chrysanthemi*) [ibid., viii, p. 242], and leaf spot (*Septoria chrysanthemella*) [ibid., vii, p. 244].

Hurst (R. R.). **Leaf spot of Hollyhock.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 26–28, 1 pl., 1929. [Received May, 1930.]

Ascochyta althaeina Sacc. et Bizz. was observed in July, 1928, to form circular, greyish-brown spots, $\frac{1}{16}$ to $\frac{1}{4}$ inch in diameter, with pale green to yellow margins, on hollyhock [*Althaea rosea*] leaves at Charlottetown, Prince Edward Island. The fungus is characterized by dark brown, ostiolate pycnidia producing uniseptate spores in a slender, hyaline, tortuous mass. Cultures were readily obtained on potato dextrose agar, and twelve out of twenty inoculation experiments with the organism gave positive results. There is some indication that the disease may be controlled by the prompt removal of old tops and dead leaves.

Laubert (R.) **Eine noch wenig bekannte Krankheit der Nelken.** [A hitherto little known disease of Carnations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 1, pp. 1–2, 3 figs., 1930.

A brief, popular account is given of the carnation disease caused by *Pseudodiscosia dianthi* [*R.A.M.*, vii, pp. 9, 426; ix, p. 247], which so far appears to occur only to a limited extent in Germany. The fungus is reported to attack the Agadir variety with great severity, while Souvenir de Cannes and Deutscher Sieger are resistant. Applications of sulphur, 1 to 2 per cent. Bordeaux mixture, solbar, and vomasol S gave negative results in the control of *P. dianthi*, but one grower was successful in reducing infection by the application of a strong salt solution.

Drayton (F. L.). **Miscellaneous notes on bulb diseases.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 20–25, 1929. [Received May, 1930.]

The results of five years' experiments in the control of dry rot and hard rot of gladioli (*Sclerotium gladioli* and *Septoria gladioli*) [*R.A.M.*, viii, p. 382] indicate that the most effective methods of treating diseased corms are as follows. For dry rot: semesan, 10 per cent., immersion for 15 minutes at 50° C., or uspulun, 10 per cent. for one hour at 20° and 10 per cent. for 15 minutes at 50°. For hard rot: semesan, 5 per cent. for 15 minutes at 50°, or uspulun, 5 per cent. and 10 per cent. for 15 minutes at 50°. In the case of slightly contaminated soil, deep ploughing combined with strict roguing of infected plants should be practised; where the soil is heavily infested, the cultivation of gladioli should be discontinued for five years or more.

Fischer (R.). **Eine häufige Gladiolenkrankheit.** [A common Gladiolus disease.]—*Gartenwelt*, xxxiv, 9, pp. 120–121, 1 fig., 1930.

A popular account is given of gladiolus scab (*Bacterium marginatum*) [*R.A.M.*, viii, p. 649], which was first definitely detected in Czecho-Slovakia and Austria two years ago, though it is believed to have been present for a considerable period in the latter country. There are three distinct manifestations of the disease, viz., the 'lacquer' scab of the corms (so-called because the sunken, brown spots are covered with a shiny veneer), the

brown pustule disease of the foliage, and the foot rot of the base of the shoots. Infection is transmitted through the diseased mother corm or by way of the soil. Control measures should be based on the destruction of all infected material and the use of healthy corms for planting. The corms should be immersed for one hour in an emulsion of 1 per cent. uspulun or germisan, or 0·5 per cent. corrosive sublimate mixed with sandy loam.

Lobik (A. I.). **Sclerotinia libertiana как причина массовой гибели Подсолнечника.** [Wholesale destruction of Sunflower caused by *Sclerotinia libertiana*.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January 1928*], pp. 177–178, 1928. [Received April, 1930.]

In this paper a summary is given of the continued investigation by the author of the sunflower rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*] in North Caucasus [*R.A.M.*, vii, p. 785]. The main new points of interest ascertained are that under local conditions the apothecia continue to discharge spores during 20 to 40 days and that the ascospores retain their viability up to 45 days after discharge. Up to the end of the flowering period of the sunflower, including the setting of the seed, infection of the host does not usually extend higher than the lower third of the stem, but after the seeds are set and up to harvest time infection of the heads is most prevalent. When the sunflower seedlings are infected at an early stage they usually die, while infection of the stems at the time of the setting of the seeds causes a reduction of up to 50 per cent. of the yield in seeds, due both to a considerable loss of specific weight and to the presence of numerous seeds which either fail to develop or the cotyledons in which are transformed into sclerotia. Actual counts showed that while in healthy heads the proportion of empty seeds averages 1·2 per cent., in infected ones it varies from 5·8 to 16·2 per cent. Under natural conditions *S. sclerotiorum* from sunflower was found to be capable of infecting *Sonchus arvensis* and safflower [*Carthamus tinctorius*]. Artificial inoculations showed that these plants, as well as lettuce, become infected in the absence of any external injury to the cuticle. The fact that under North Caucasian conditions the fungus exhibits a marked selectivity in its parasitism, restricted to a small group of Compositae, leads the author to consider it a special biological form, for which the name *S. libertiana* [*S. sclerotiorum*] f. *caucasica* f. biologica *parasitica* is suggested.

Experiments showed that the time needed for the formation of apothecia is directly proportional to the depth at which the sclerotia are buried, and it varied from 35 days at a depth of 1 cm. to 111 days at 8 cm.; no germination occurred below 8 cm. Sclerotia treated with formalin or mercuric chloride solutions or with the vapour of carbon bisulphide, either in a dry condition or after a preliminary dipping in water for six hours, gave the following proportions of rotting after their burial in soil: treated dry with formalin or mercuric chloride 30 and 40 per cent., respectively; treated after dipping 60 and 70 per cent., respectively; while carbon bisulphide killed 100 per cent. in both cases.

Feucht (W.). **Morphologische Abweichungen an Bromus erectus, verursacht durch Ustilago hypodytes.** [Morphological modifications in *Bromus erectus* caused by *Ustilago hypodytes*.]—*Angew. Bot.*, xii, 1, pp. 1–16, 3 figs., 2 graphs, 1930.

Bromus erectus in the valley of the Saale near Jena is stated to be extensively attacked by the stem smut *Ustilago hypodytes*, which causes the suppression of panicle formation; the development of an abnormally large number of internodes (about double those of healthy plants) and consequently also of leaf sheaths and leaf blades; the curtailment of the upper part of the internodes; and the extremely regular insertion of the leaves in two orthostichies in a vertical plane on the stem. It is estimated that diseased shoots only attain about two-thirds of the normal length. The fungus usually forms its spore layers in the sixth and seventh internodes, which are completely enclosed in their leaf sheaths. At flowering time the lower and middle internodes rupture under the increasing mass of the spore layers, which thus become plainly visible, while the upper internodes usually remain permanently enclosed.

U. hypodytes was also found in 1929 on *Agropyron repens* [*R.A.M.*, vi, p. 321], the symptoms on this host differing considerably from those observed on *B. erectus*. The number of internodes is not excessively large, nor is their curtailment conspicuous. The fungus forms its spore layers in the upper internodes, which extend beyond the enclosing leaf sheaths; the projecting portion is weakened and bends over sharply. The uniform distribution of the leaf blades, characteristic of infected brome grass, is not apparent on *A. repens*.

Hurst (R. R.). **Resistance of Timothy selections to rust (Puccinia phleipratensis Erikss. et Henn.).**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 25–26, 1929. [Received May, 1930.]

Of the 22 strains of timothy [*Phleum pratense*] investigated for their reaction to rust (*Puccinia phlei-pratensis*) [*R.A.M.*, iii, p. 583; vii, p. 518] at Charlottetown, Prince Edward Island, and Kentville, Nova Scotia, several exhibited well-defined resistance (e.g., Ottawa Nos. 2, 11, 13, and Gloria). This feature was consistent in all the plants of each selection, indicating the dominance of the factor for resistance. A marked tolerance towards rust was shown by some of the other strains, but head infection impaired the development of seed in Huron and Ohio 28. Studies on the viability of overwintered spores failed to yield conclusive evidence regarding the manner of survival of the fungus, and it is believed that the late season infection of timothy, which is the only type hitherto observed, takes place through the agency of wind, air currents, birds, and insects.

Crosby (C. R.), Mills (W. D.), & Blauvelt (W. E.). **Protecting orchard crops from diseases and insects.**—*Cornell Agric. Exper. Stat. Bull.* 498, 80 pp., 18 figs., 1929.

This very useful publication gives brief popular accounts of the principal parasitic diseases and insect pests of orchard crops

[arranged in the alphabetical order of the common names of the hosts] which occur in the State of New York, together with recommendations for their practical control. Much of the information contained in it is stated to have been obtained from unpublished data supplied by research workers of the State experiment stations and of the spray investigation service. Spray schedules are outlined for each kind of fruit tree, and hints as to the preparation and application of the sprays are given in a chapter at the end of the bulletin.

HOCKEY (J. F.). **Report of the Dominion Field Laboratory of Plant Pathology, Kentville, N.S.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 131–142, 4 figs., 1929. [Received May, 1930.]

Further studies have been conducted on the seasonal development of the apple scab fungus (*Venturia inaequalis*) [*R.A.M.*, viii, p. 353 and above, p. 432]. Spore traps were laid down at eight centres in Kentville, at six of which meteorological records of temperature and rainfall were taken. The first light discharge of ascospores took place on 3rd May, and on the 12th and 13th the first general discharge was reported, followed by a very heavy and widespread ejection from the 23rd to 26th. The total number of days on which discharges occurred was 39. There were approximately six spore ejections before petal fall for every one after that period, a fact that emphasizes the relative importance of the pre-blossom and calyx sprays. The same general condition, with slight variations, prevails annually in Kentville.

The first infections bearing conidia were found in the open on 28th May, 25 days after the first recorded discharge and 15 days after the initial general ejection of ascospores. A month later, unsprayed trees showed up to 85 per cent. spotted foliage in many orchards. The two experimental orchards at Middleton and Berwick are used in co-operation with the Entomological Laboratory, Annapolis Royal, for apple scab observations [details of which are given]. At Middleton records of the seasonal development of *V. inaequalis* have been obtained for two years by means of perithecial examination, spore traps, and observations on foliage and fruit infection under natural conditions. It was found that inoculum was most plentiful and the chances of infection greater immediately before and during the flowering of the trees than at any other time of the season. At this stage the younger terminal leaves are in a highly susceptible condition and consequently much more liable to infection than the lateral clusters; hence the protection of this foliage is of extreme importance.

Very good control of scab was given by five applications of a mixture of aluminium sulphate 4 : hydrated lime 8 : water 400 : lime-sulphur 15 (sp. gr. 1·008). In laboratory tests this mixture, and also lime-sulphur 16 : 480, completely inhibited spore germination in 36 hours.

The best control of sooty blotch of apples (*Gloeodes pomigena*) [ibid., vii, p. 176] was given by a 30 minutes' dip in 2 per cent. washing soda.

Osterwalder (A.). **Schorfbekämpfungsversuche im Sommer 1929.** [Scab control experiments in the summer of 1929.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, pp. 5–12, 1930.

The results [which are fully described and tabulated] of further experiments in the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*] were reported to the sixth conference on the control of fruit diseases at the Wädenswil (Switzerland) Fruit Growing Institute on 30th November, 1929 [*R.A.M.*, viii, pp. 316, 317]. It was found that early applications (up to June) of lime-sulphur (1 in 8 before the bursting of the buds and 1 in 30 or 1 in 40 subsequently) sufficed to protect the foliage, and also the fruit in early apple varieties, whereas for late ones two to three treatments (say, middle of July, and beginning and end of August) are essential. Four applications of solbar (0·5 and 1 per cent.) gave good control of scab on both apple and pear leaves and of white spot [*Mycosphaerella sentina*] on the latter, but was less satisfactory on the fruit; it is also considerably dearer than lime-sulphur. Four applications of 1·5 per cent. volck + 1·5 per cent. fungol controlled scab and white spot on pear leaves, but was inadequate on the fruit, and also on apple foliage. Moreover, the cost of this mixture (Fr. 8·25 per 100 l.) is prohibitive.

Anderson (H. W.). **Experiments with blister canker of Apple trees.**—*Illinois Agric. Exper. Stat. Bull.* 340, pp. 55–90, 13 figs., 2 diags., 1 graph, 1930.

In the present paper the writer recapitulates the data on which his previous publication on the control of blister canker of apple (*Nummularia discreta*) was based [*R.A.M.*, ii, p. 270], and supplements them by further information secured during the last eight years.

The disease causes heavy losses in Illinois orchards owing to the prevalence of the susceptible Ben Davis and Gano varieties, which constituted 30 per cent. of the bearing apple trees of the State in 1920. In one county about 50,000 trees, mostly under 30 years old, were removed during the past four years, largely owing to blister canker. Other hosts of the fungus in Illinois include mountain ash (*Sorbus americana* and *S. hybrida*), honey locust (*Gleditsia tricanthos*), and white elm (*Ulmus americana*).

Discussing the life-history of *N. discreta*, the writer points out that a continuous supply of ascospores is constantly available for infection, their most active discharge occurring from July to October, inclusive, usually within two or three days after a heavy rain. The ascospores retain their viability for at least a year.

The results of ten years' experiments have failed to give conclusive information regarding the mode of dissemination of the fungus, but there seems every reason to believe that ordinary agents are operative. Infection occurs exclusively on the wood of the tree, never on the fruit, leaves, or current season's growth. The fungus is a wound parasite, invading the tree only through broken bark. The cankers usually appear where the relatively dry xylem is near the surface of the limb, but extensive invasion of the wood occurs before external manifestations of infection are observed.

The disease is particularly prevalent in poorly drained areas, but other physical factors, such as soil type, site of orchard, and amount of rainfall, do not seem to influence its incidence. The type of tree growth plays an important part in the occurrence of blister canker, which is much more liable to attack individuals making alternately rapid and slow growth than those developing at a uniform rate. Excision of cankers is effective in reducing the number of new infections if the operation is conducted regularly and thoroughly [ibid., viii, p. 292]. Highly resistant varieties, e.g., Grimes, York Imperial, Oldenberg, or Winesap, are more suitable for interplanting with Ben Davis than the moderately susceptible Delicious, Yellow Transparent, or Jonathan.

TILLER (L. W.). **Cold storage of fruit. Investigations conducted with Apples during 1927–1928.**—*New Zealand Dept. of Scient. & Ind. Res. Bull.* 16. 23 pp., 4 pl., 2 graphs, 1929.

This is a brief report of the results obtained in the 1927–8 season in the continued study of the behaviour of Sturmer and Jonathan apples in cool storage at the Nelson Freezing Company's stores, Stoke [*R.A.M.*, v, p. 562]. It was found that, in a small experimental chamber, uniformity of temperature at all points was best attained by an air circulation system operating from ceiling to floor. As in the former experiments, internal breakdown was more in evidence at low than at higher temperatures, but considerable variations were found in the relative resistance of the varieties of apples to low temperatures. At the same temperature less breakdown developed in low than in high relative humidity of the air. The incidence of the trouble appeared to be profoundly influenced by the cultivation of the orchards and climatic factors. In a special series of experiments carried out in 1927 and 1928, the storage qualities of the fruit were materially improved by a well-balanced manurial programme, and there was also evidence that the rootstock on which the variety is grafted may influence the condition in which the variety turns out at the end of the storage period.

The results also indicated that a limited measure of control of Jonathan spot is afforded by the use of oiled wrappers. Temperature was not a factor in the development of this spot, except in one case in which it developed to a lesser extent at a temperature of about 38° than at about 32° F. Neither was the incidence of the trouble affected by storage humidity. A slight increase in the percentage of the spot was caused by delay between picking and storing the apples, but the increase was very small compared with that produced by late picking. It is therefore recommended that, to obviate Jonathan spot, the apples be picked as early as feasible without detriment to colour and flavour. A parcel of Jonathans which was conditioned as for export and then kept in cold storage for three months did not develop over 3 per cent. internal breakdown during periods of up to three weeks when exposed to normal conditions, and fungal trouble was also almost totally absent from it.

Moll (F.). **Pilzschäden in Fruchtlägern.** [Fungous damage in fruit storehouses.]—*Mitt. Gesellsch. für Vorratsschutz*, vi, 1, p. 15, 1930.

Extensive fungous infection was detected in the fruit storehouse of a well-known German firm. The wooden walls of the ripening rooms (in the basement) were infested by *Penicillium* sp. and an immature Basidiomycete, the double-layered pasteboard ceiling with *Cladosporium*, *Dematium pullulans*. and *Penicillium*, and the ceiling of the cellar with *Penicillium* and *Spicaria*. The fungi spread to the packing-cases, baskets, &c., containing the fruit, and should be removed by the application of sodium fluoride to the walls and other parts of the storehouse.

McCubbin (W. A.). **Report of Peach yellows inspection in Pennsylvania—1929.**—*Plant Disease Reporter*, xiv, 4, pp. 33–37, 1930. [Mimeographed.]

During 1929, 661 orchards in 25 counties of Pennsylvania were inspected for peach yellows [*R.A.M.*, vii, p. 792], and for the first time in the history of the work the number of trees examined exceeded one million (1,030,165). In these orchards 1,570 trees were marked for yellows or little peach, making the average incidence of infection 0·152 per cent. It would appear from the results of the annual inspections that certain parts of the State are natural centres of infection where the disease will spread rapidly if left unchecked, while in others the conditions are such that dissemination is slow. The inspection work covered the period from 1st July to 31st August.

Curtis (K. M.). **Peach culture. Part I.—Four years' control of brown rot in New Zealand.**—*New Zealand Dept. of Scient. & Ind. Res. Bull.* 15, pp. 4–17, 4 pl., 4 graphs, 1929.

After giving a semi-popular account of the life-history of brown rot of peaches [*Sclerotinia americana*: *R.A.M.*, ix, p. 115] in New Zealand, the author discusses the results of control experiments which were conducted from 1924 to 1928 in the district of Umukuri with the peach varieties Kalamazoo, Wiggins, and Mamie Ross. In the first season the treatment reduced the amount of the disease from the heavy general infection prevailing in previous years to an average of 1·77 per cent. in the three varieties, which was further reduced to 0·42, 0·24, and 0·18 per cent. in the three following seasons.

These encouraging results were obtained by a combination of careful sanitation of the orchard and trees (i.e., the removal and destruction of fruit mummies from the ground and trees, the elimination of diseased fruits as soon as they appeared, and the cutting-out after blossoming of all lateral twigs bearing diseased blossoms) with the application of fungicidal sprays. The spraying schedule consisted of four fundamental sprays at the bud-movement, pink to blossom, petal fall, and immediate pre-maturity stages, together with an interpolated series between petal fall and pre-maturity which varied in each season according to the weather and the amount of blossom infection. When weather conditions demanded it the fundamental sprays were repeated,

without interfering with the interpolated treatments. The sprays used in the experiments were those normally employed in pome-fruit orchard practice, namely, Bordeaux and lime-sulphur mixtures, but it is believed that even more complete control might have been attained with 'dry-mix' lime-sulphur, precipitated sulphurs, or a precipitated sulphur plus lime-sulphur.

A study of the rainfall and humidity statistics at Auckland, Hastings, Motueka, and Roxburgh, considered as representative peach-growing districts, indicated that control of brown rot should be almost equally difficult to attain in Auckland and Motueka, somewhat less difficult in Hawke's Bay, and least difficult in Otago. Effective control of the disease can only be reached by persistent attention to details. If the above measures are universally observed, and pre-maturity sprays are applied to suit each particular variety and not merely the majority of the varieties, in districts such as Auckland and Nelson, it should be possible to avoid the necessity for the interpolated series of sprays.

FISH (S.). **Brown rot and transit rot and their control. A report on consignments of Peaches sent from the Goulburn Valley to the Sydney market.**—*Journ. Dept. Agric. Victoria*, xxviii, 1, pp. 33–43, 5 figs., 2 graphs, 1930.

During the seasons 1924–5, 1925–6, and 1926–7, some 250,000 cases of peaches were dispatched to the Sydney market from the Goulburn Valley, the total annual value of the consignments being estimated at £100,000, or 8 shillings per case. The loss during this period from brown and transit rots (*Sclerotinia americana* and *Rhizopus nigricans*) [*R.A.M.*, viii, p. 320] amounted to £30,000 per annum (2*s.* 6*d.* per case). In 1927–8 about 300,000 cases reached Sydney from the same source, and the estimated loss due to disease was £37,000. Of 39 consignments examined at Sydney in 1928, five were sound, while the remainder showed percentages of brown and transit rots varying from 20 to 100. Of the two fungi implicated in the decay of market peaches, *R. nigricans* has been found by far the more important. Cultures of this organism were obtained from the surface of a sound peach still on the tree, the dust of the picking bags, boxes, grader, lorries, and railway trucks, the atmosphere of the packing shed and of the market, new cases stacked in contaminated sheds, besides diseased fruits. By boiling the picking bags and boxes for three minutes and washing the grader with 10 per cent. copper sulphate solution, it was possible to reduce the incidence of transit rot from 38 to 20 per cent. The sources of brown rot are diseased fruit, leaves, and twigs, the spores of the fungus being disseminated by the wind. Cultures of *S. americana* were obtained from the air in the orchards and from the surface of a sound unripe peach on the tree; the fungus is further spread by picking and grading operations.

It was found in a single test that spraying 200 Pullars Cling peaches with lime-sulphur reduced the incidence of brown rot from about 45 to 5 per cent., whereas transit rot was unaffected by the treatment. This confirms the results obtained in a similar test by Brooks and Fisher (*Journ. Agric. Res.*, xxii, p. 477, 1921).

Experiments with mechanically injured and sound fruit showed

that wounding is necessary for infection by *R. nigricans*, while *S. americana* is able to penetrate sound fruit, though less readily than where an injury is present. The development of brown rot is favoured by a period of cloudy weather, followed by frequent showers at picking time. Transit rot is generally very severe in seasons when heavy rains fall immediately after the final irrigation before picking has been given. Low temperatures were found to retard the development of *R. nigricans* to a relatively greater extent than that of *S. americana*, the growth of the former being entirely inhibited at 32° to 40° F. in a saturated atmosphere, while at 74° all the fruit was severely infected. *S. americana* took 17 days to develop into a spot 1 cm. in diameter at 32°, and only one day at 71°. Very promising results have been given by preliminary experiments in the dispatch of the fruit in pre-cooled and iced trucks, the prices obtained for such cases sometimes amounting to double those given for uncooled fruit in ordinary iron Louvre trucks.

Rosella (E.). **Le dépérissement des Abricotiers à Roquevaire.** [The dying-off of Apricots at Roquevaire.]—*Prog. Agric. et Vitic.*, xcii, 44, pp. 427–430, 1929.

In this brief note the author states that observations at Roquevaire [near Marseilles] on the serious dying-off of apricot trees which is very prevalent there, have led him to conclude that the majority of cases of apoplexy [*R.A.M.*, ix, p. 256] studied were directly caused by attacks of the larva of *Capnodis tenebrionis*, which burrows in the trunks. The comparatively few cases in which the trees showed precursory symptoms before dying were probably due to root rot [*Armillaria mellea*]; it is pointed out that such cases are particularly frequent on dry soils. Control measures against the insects are briefly indicated.

Osterwalder (A.). **Versuche über Bekämpfung der Schrotschusskrankheit an Kirschbäumen im Sommer 1929.** [Experiments in the control of the shot hole disease of Cherry trees in the summer of 1929.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, pp. 21–25, 1930.

The best control of shot hole of cherries (*Clasterosporium carpophilum*) [*R.A.M.*, viii, p. 796] in the Wädenswil district of Switzerland was given in 1929 by three applications (on 22nd April, 15th May, and 23rd May) of 1 in 40 lime-sulphur + 400 gm. lime arsenate per 100 l. Almost equally good results were obtained with 1·5 per cent. volck-sommer + 1·5 per cent. fungol, which is, however, considerably more expensive [see above, p. 461]. Kukaka [ibid., vii, p. 698] was also effective against shot hole, but caused injury to the leaves.

Kessler (H.). **Schrotschussbekämpfungsversuche an Kirschbäumen in Sevelen, in Flums und in Wädenswil-Herrlisberg im Jahre 1929.** [Shot hole control experiments on Cherry trees in Sevelen, Flums, and Wädenswil-Herrlisberg in the year 1929.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, pp. 25–29, 1930.

The experiments in the control of shot hole of cherries (*Clastero-*

sporium carpophilum) at the Wädenswil Fruit Growing Institute [see preceding abstract] were supplemented in 1929 by tests in various other localities of German Switzerland. Good control was given by a pre-blossom application of 3 per cent. Bordeaux mixture or 12 per cent. lime-sulphur and by subsequent treatments with 1·5 per cent. Bordeaux mixture and 2·5 per cent. lime-sulphur. The results were particularly striking in the Sevelen district, where shot hole is a limiting factor in cherry production. The addition of lime arsenate to the fungicides greatly increased the adhesiveness of the latter.

STAEHELIN (M.). **Die Bekämpfung des Frostspanners und der Schrotschusskrankheit der Kirschbäume.** [The control of the winter moth and shot hole disease of Cherry trees.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, pp. 29–35, 2 figs., 1930.

Directions are given in popular terms for the control of the winter moth [*Cheimatobia brumata*] and shot hole disease of cherries [*Clasterosporium carpophilum*: see preceding abstracts], both of which are stated to cause very heavy damage in Switzerland. On the basis of five years' experiments in various parts of the French and German cantons, the writer recommends spraying with 1 per cent. Bordeaux mixture for the control of shot hole, the first application being given after flowering and the second 10 to 15 days later. Good results were also given by 1 per cent. fungol and volck-sommer, but lime-sulphur (1 in 40) and solbar proved less satisfactory. Winter treatments with 10 per cent. carbolineum or lime-sulphur (1 in 8) were useless unless supplemented by systematic summer control.

ERNI (W.). **Bekämpfung der Schrotschusskrankheit und tierischer Schädlinge der Obstbäume.** [Control of shot hole disease and insect pests of fruit trees.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, pp. 35–38, 2 figs., 1930.

In 1929 the writer obtained excellent control of the winter moth [*Cheimatobia brumata*] and shot hole of cherries [*Clasterosporium carpophilum*: see preceding abstracts] in the orchards round the Lake of Thun (Switzerland) by two applications of lime-sulphur plus lead arsenate (Maag), just before and after flowering, followed by a further two treatments with 2 per cent. lime-sulphur and 0·1 per cent. iron sulphate. Untreated trees in the vicinity were semi-defoliated by the middle of July.

HOCHSTRASSER (H.). **Bekämpfung der Schrotschusskrankheit und tierischer Schädlinge der Steinobstbäume.** [Control of the shot hole disease and insect pests of stone fruit trees.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, p. 38, 1930.

In the Zürich district of Switzerland the shot hole disease of cherries [*Clasterosporium carpophilum*: see preceding abstracts] has been well controlled by a pre-blossom application of 10 per cent. lime-sulphur, followed by two post-blossom treatments with 2·5 per cent. lime-sulphur plus 2 per cent. lead arsenate.

Zeller (A.). **Finanzieller Mehrerfolg durch Spritzen der Kirschbäume gegen die Schrotschusskrankheit.** [Financial gain through spraying Cherry trees against the shot hole disease.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxix, 1–2, pp. 41–42, 1 graph, 1930.

In 1929 three cherry trees at Rheineck (St. Gall, Switzerland) were given two applications of kukaka (2·5 per cent. at the bursting of the leaf buds and 1·75 per cent. immediately after petal fall) and a subsequent treatment with 2·5 per cent. lime-sulphur against shot hole [*Clasterosporium carpophilum*: see preceding abstracts]. The total cost of these operations (including labour) is estimated at Fr. 13 and the value of the yield at Fr. 186·30. For five years before spraying was undertaken, the maximum value of the yield was Fr. 49·50 and even after treatment in 1927 and 1928 it only amounted to Fr. 68·70 and 55·20, respectively, so that the present position represents a marked gain.

Wardlaw (C. W.). **Panama disease research.**—*Trop. Agriculturist*, lxxiv, 1, pp. 36–44, 1930.

This is a reproduction *in extenso* of the author's summary of the two reports on the Panama disease (*Fusarium cubense*) of bananas which were recently submitted to the Empire Marketing Board [*R.A.M.*, viii, pp. 796, 797].

Goodwin (W.), Martin (H.), & Salmon (E. S.). **The fungicidal properties of certain spray-fluids, VI.**—*Journ. Agric. Sci.*, xx, 1, pp. 18–31, 1930.

Continuing their studies of the fungicidal properties of certain spray fluids [*R.A.M.*, ix, p. 45], the authors describe experiments in which they tested the action of suspensions of ground sulphur, flowers of sulphur, and colloidal sulphur on the conidial stage of hop mildew (*Sphaerotheca humuli*). When wetted by a soft soap solution and applied to the mildew patches in the form of a fine spray, ground sulphur and flowers of sulphur had a marked fungicidal action, which became complete with suspensions containing 5 gm. sulphur to 100 c.c. of 0·5 per cent. soft soap solution. The actual amount of sulphur deposited on the fungus patches, however, did not strictly correspond to the strength of the suspension, owing to the settling of the sulphur particles at the bottom of the atomizer during the process of spraying.

Tests with spreaders other than soft soap showed that substances of an acid nature, e.g. gelatine and saponin, inhibited the fungicidal action of the sulphur, while those of an alkaline nature, such as lime casein, soda casein, and dry-mix sulphur lime favoured this action. Such spreaders had a similar effect on the fungicidal action of a commercial colloidal sulphur (ialine) which, when tested with soft soap solution, was found to be completely fungicidal at the rate of 0·3 gm. to 100 c.c. of a 0·5 per cent. soap solution.

The paper also includes a brief reference to the possible influence of the spreader upon the hydrolysis of sulphur [see next abstract].

Martin (H.). **The hydrolysis of sulphur in relation to its fungicidal activity.**—*Journ. Agric. Sci.*, xx, 1, pp. 32–44, 1930.

In this paper the author discusses the results of the experiments described in the preceding abstract on the fungicidal action of sulphur sprays on the hop mildew (*Sphaerotheca humuli*) from the point of view of the hypothesis that this action is due to hydrolysis of the sulphur particle which comes in contact with the fungus. This view is supported by the fact, established in these experiments, that the fungicidal action of sulphur was enhanced by the presence in the sprays of alkali, which is known to bring about an acceleration of this hydrolysis, and it affords an explanation of the inhibition of the fungicidal action by gelatine or saponin solutions, which have an acid reaction. A further confirmation of the view that the inhibitive action exerted by these spreaders is due to their acidity was supplied by the fact that the fungicidal properties of the sprays containing them was greatly enhanced by the addition of alkali.

A striking parallelism was also found between the fungicidal action of the sprays tested and their tarnishing effect upon copper strips immersed in them at ordinary temperatures, the stain developing well in alkaline spreader solutions and its production being inhibited in the acid ones.

The paper terminates with a theoretical discussion of the bearing of the hydrolysis hypothesis on the findings of other investigators of the fungicidal action of sulphur, most of which have been noticed in this *Review* [*R.A.M.*, vii, pp. 335, 737 ; viii, pp. 514, 798.] According to present day views, the primary products of the interaction of sulphur and water are hydrogen sulphide, already known to be fungicidal, and sulphoxylic acid, which is chemically allied to the thiosulphuric acid to which the fungicidal properties of sulphur have also been attributed.

Roach (W. A.). **Sulphur as a soil fungicide against the Potato wart disease organism.**—*Journ. Agric. Sci.*, xx, 1, pp. 74–96, 4 figs., 4 graphs, 1930.

The purpose of the investigation reported in detail in this paper was to establish the chemical changes undergone by sulphur in the soil, in the attempt to find an explanation of the toxic effect of sulphur on the sporangia of the potato wart disease organism (*Synchytrium endobioticum*) [*R.A.M.*, vii, p. 737]. The experiments were made mainly with two kinds of soil, namely, a sandy potato soil from Ormskirk, and a stiff clay from Rothamsted. The results showed that thiosulphuric acid can exist in a free state and that it is relatively stable in dilute solution, since an M/200 solution was only half decomposed at the end of one day, and an M/400 solution at the end of 10 days only. This degree of stability is considered to be sufficient to account for the fungicidal action of acidified thiosulphate solutions in terms of the liberated thiosulphuric acid. Calculations indicated that the lethal action of sulphur to the spores of *S. endobioticum* may be explained if it is assumed that 6 per cent. of the minimum quantity of sulphur found effective against the disease in the field is present in the

form of thiosulphuric acid over a period of ten days. It is admitted that no definite evidence was obtained of the accumulation of appreciable quantities of thiosulphuric acid in the soil, but reasons are adduced to show that this negative finding is not final.

Experiments of a preliminary nature proved the formation of pentathionate in the Rothamsted soil kept at 30° C., but not in Ormskirk soil at the same temperature, nor in either soil at lower temperatures. Chemical considerations and the review of the work done by other investigators suggest that the pentathionate actually identified in the soil solution arose from thiosulphuric acid in an early stage of the oxidation of the sulphur.

In an appendix to this paper R. P. Hobson briefly describes some experiments of his own which confirm Roach's observations.

Hollrung (M.). **Forschungs- und Lehrtätigkeit auf dem Gebiete der Pflanzenpathologie in Deutschland.** [Research and teaching activity in the field of plant pathology in Germany.] —*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1216–1223, 1929.

The history of phytopathology is concisely outlined from the earliest times to the present day, with special reference to the outstanding features of its development in Germany under Persoon, De Bary, Kühn, Sorauer, and others. Some observations are made on methods of teaching phytopathology, the facilities for instruction in this branch of science at the various German universities and colleges, and other points of interest.

Morstatt (H.). **Pflanzenpathologie als Wissenschaft und Unterrichtsgegenstand.** [Plant pathology as a science and subject of instruction.]—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1194–1203, 1929.

Some general tendencies of phytopathological development in various countries are discussed with special reference to the study and teaching of plant pathology. A course of study should, in the author's opinion, embrace (1) general plant pathology, including the non-parasitic diseases and plant protection; (2) applied mycology and bacteriology; and (3) applied zoology (chiefly entomology). Of these only applied mycology and entomology at present figure in the usual curriculum. Some suggestions are made for the best methods of subdividing these branches of instruction and in this connexion some important recent developments in different aspects of research are outlined.

Whetzel (H. H.). **The terminology of phytopathology.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1204–1215, 1929.

The author draws attention to, and suggests remedies for some of the more salient incongruities and inconsistencies in the terminology of plant pathology. The confusion which exists is attributed partly to the fact that new knowledge has outdistanced the terminology, and partly to the influence of mycology, etiology, bacteriology, and economic considerations.

An outline is given for arranging the data on an individual plant disease under special headings used by the author. The phrase 'parasite and host' properly designates only the food relation between the two; the disease relationship should be expressed by 'pathogen and suscept'.

Plant diseases fall into three main groups, (1) those where the disease processes end in the degeneration and death of the cells, or *necrosis*, (2) those where they end in a slowing up or halting of the normal development of the protoplasts, or *hypoplasis*, and (3) those which express themselves in over-development, or *hyperplasis*. The classification of symptoms falls into the same three groups. This point is illustrated by the current misuse of the term chlorosis to indicate both hypoplastic and necrotic diseases.

That phase of the life-cycle of a pathogen when it becomes and remains associated primarily with the living tissues of the suscept the author designates pathogenesis. Following pathogenicity, sometimes partly coinciding with it, is a period, referred to as saprogenesis, when many pathogens show no pathogenic activity.

Pathogenesis falls into three stages, inoculation, incubation, and infection.

The facts and deductions concerned with the influence of environmental factors on disease should be grouped under the term epiphytology.

Plant disease control is divided into four fundamental principles, exclusion, eradication, protection, and immunization, of which the two former concern the pathogen and the two latter the suscept.

Reddick (D.). **An international plant health league: a proposal.** —*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1227–1230, 1929.

To expedite a solution of the problem of controlling the diseases of economic crops by facilitating the exchange of views and material the author outlines proposals for the formation of an international league of workers specially interested in the production of immune and resistant varieties. An address list of the members, stating their requirements and what they offer in exchange, would be prepared and distributed annually, the further functioning of the league then becoming a personal matter between interested individuals. Only a very trifling subscription would be necessary.

Ramsbottom (J.). **Orchid mycorrhiza.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1676–1687, 24 figs., 1929.

The author brings forward and discusses evidence in support of his belief in the symbiotic theory of germination in orchids; the term symbiosis should be taken to mean only that two organisms of different affinities live constantly in close association. In the author's opinion, Knudson's interpretation of non-symbiotic germination [cf. *R.A.M.*, ix, p. 329] of orchard seeds as due to stimulation by the production of sugars by many fungi (including the orchid fungus) is not supported by the facts as observed in nature.

The fungus extracted from an orchid and grown in culture will bring about the germination of its seeds in conditions where, without the fungus, germination does not occur. Seeds germinated in this way, with abundant infection of the cells of the protocorm and root, flower normally.

The mycelium always enters the orchid seed at the suspensor end, and the cells at the opposite end do not become infected. There is no support for the statement that intensity of infection causes the death of the seedlings. Further, seeds which adhere to the sides and top of the flasks germinate if hyphae reach them. The author never observed a young rootlet to become infected until it had entered the soil.

WHITE (P. R.). **Mycorrhiza as a possible determining factor in the distribution of the Strawberry.**—*Ann. of Botany*, xliii, 171, pp. 535–544, 6 figs., 1929.

A typical arbusculate fungus with the appearance of a mycorrhizal endophyte has been found in the roots of the Chilean strawberry (*Fragaria chiloensis*) in the western United States, and it is thought that this discovery may explain certain anomalies in the species, especially as regards distribution, which have long puzzled horticulturists. *F. chiloensis* is restricted, according to present information, to three types of associations, viz., (1) pure stands on clean, spray-washed sand; (2) *Fragaria*-Ericaceae associations on acid soils (North Pacific coast); and (3) associations on volcanic soils.

The fungus, which was also found in *F. nilgherrensis*, *F. platypetala*, and the Rockhill, Dunlap, and Ettersburg 121 horticultural varieties, is characterized by highly irregular, hyaline to yellowish hyphae measuring 10 to 15 μ in the large, fleshy, adventive roots, 5 to 7 μ in the slender, fibrous branch roots, and 2 to 15 μ in culture (on a medium consisting of agar prepared with a boiled extract of strawberry roots). The haustoria are often very irregular in outline and covered with knob-like processes; by continuous ramification they give rise to the typical arbuscles of endotrophic mycorrhiza [*R.A.M.*, vii, p. 524], which eventually degenerate or are digested, leaving an amorphous mass attached by a stalk to the cell wall.

The variation in the diameter of the hyphae in culture was so striking as to suggest the possibility of a contamination, but the occurrence of frequent anastomoses by H-connexions left no doubt that the wide and narrow hyphae belong to the same organism. Pycnidia were developed in some of the cultures and are initiated by an interlocking of two branches from large hyphae. At maturity they are sub-spherical, 100 to 200 μ in diameter, pale yellowish-brown, often with two ostioles, and slightly papillate at the mouth. The numerous spores are unicellular, slightly falcate, with blunted ends, 4 to 6 by 2 to 3 μ, mostly devoid of oil droplets. The fungus is believed to be a species of *Phoma*. Vesicles of the type figured by Miss Rayner (*Ann. of Bot.*, xxix, p. 97, 1915) are rare on the pycnidial strains, but occur in profusion on some of the others.

WALKER (J. C.). **Some remarks on the physiological aspects of parasitism.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1263–1270, 1929.

In this paper the author summarizes and discusses the results obtained from his own investigations and those of other workers [most of which have already been noticed in this *Review*] into the physiological relationships existing between host and parasite in a number of fungal diseases of plants, special reference being made to onion smudge (*Colletotrichum circinans*) [*R.A.M.*, ii, p. 492; iv, pp. 325, 519; ix, p. 284], onion neck rot (*Botrytis byssoidea*) [ibid., iv, p. 392; v, p. 273], and bean anthracnose (*C. lindemuthianum*) [ibid., iii, p. 109]. The effects of temperature on parasitism, as exemplified especially by seedling blight of cereals (*Gibberella saubinetii*) [ibid., viii, p. 553] and black root rot of tobacco (*Thielavia basicola*) [ibid., vii, p. 278] are described.

STAKMAN (E. C.). **Physiologic specialization in pathogenic fungi.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1312–1330, 1929.

In this paper the author reviews briefly the existing state of knowledge concerning physiologic specialization in pathogenic fungi, reference being made to numerous recent investigations [most of which have already been noticed in this *Review*]. He discusses the means of recognizing the different physiologic forms, their origin and constancy, the relation they bear to epidemiology, and how a knowledge of their existence may affect quarantine regulations. Their importance as biologic reagents [cf. *R.A.M.*, iii, p. 638] is indicated, and insistence is laid upon the urgent necessity of knowing the number, pathogenic capabilities, and distribution of the various physiologic forms of pathogenic fungi concerned before attempting to produce resistant varieties of crops. A bibliography of nearly 100 titles is appended.

SCHAFFNIT (E.) & VOLK (A.). **Beiträge zur Kenntnis der Wechselbeziehungen zwischen Kulturpflanzen, ihren Parasiten und der Umwelt. (II. Mitteilung). Über den Einfluss der Ernährung auf die Empfänglichkeit der Pflanzen für Parasiten. (II. Teil).** [Contributions to the knowledge of the interrelations between cultivated plants, their parasites, and the environment. (Note II). On the influence of nutrition on the susceptibility of plants to parasites. (Part II).]—*Phytopath. Zeitschr.*, i, 6, pp. 535–574, 11 figs., 2 diags., 1 graph, 1930.

The authors have extended their investigations on the influence of nutrition on the susceptibility of cultivated plants to the attacks of fungous parasites to a number of woody plants. The technique of the experiments, which covered a period of three to four years, was substantially identical with that employed in the case of the herbaceous plants [*R.A.M.*, vi, p. 570].

The following plants and parasites were used: roses with the conidial stage of *Sphaerotheca pannosa*; gooseberries with that of *S. mors-uvae*; red and black currants (Red Dutch and Lee's Black, respectively), with *S. mors-uvae* and *Gloeosporium ribis* f. sp.

nigri; Paradise apple stocks with *Podosphaera leucotricha*; Mosel Riesling vines with *Uncinula necator* and *Plasmopara viticola*; and peaches and cherries with *Clasterosporium carpophilum*.

The results of the experiments [which are tabulated and discussed at some length] were similar to those obtained in the previous series. A deficiency of nitrogen and phosphoric acid rendered the plants comparatively resistant to fungous infection; those receiving an abundance of nitrogen and little potash were highly susceptible; while an intermediate position was occupied by the plants which were given normal quantities of all the constituents and by those to which an excess of potash and phosphoric acid was applied. An abundance of nitrogen and deficiency of potash resulted in the shortest incubation period of the parasite in the host, the most extensive sporulation, and the longest duration of activity of the fungus on its host. Where nitrogen and phosphoric acid were absent the situation was completely reversed, the fungi in such cases often causing only a discoloration of the leaves and forming no fructifications. On plants receiving only small quantities of phosphoric acid fructifications may be produced, but they are not vigorous and manifest a considerable reduction of germinability and infective capacity as compared with those developing on normally nourished plants. A case in point is furnished by the conidia of *Cladosporium fulvum* on tomatoes [included in the previous series of trials].

The differences of attack conditioned by the varying modes of nutrition are expressed not only by alterations in the degree, but also in the nature, of the infection. These differences may be manifested either in an entirely divergent coloration of the mycelium or in that of the leaf spots (*C. fulvum* on tomato, *G. ribis* on black currants, and *Ustilago maydis* [*U. zeae*] on maize [included in the previous series]).

A possible basis for these divergences of infection is afforded by the difference in cell structure of the variously nourished plants, the parasites penetrating more readily into the large-celled tissues of the plants receiving a superfluity of nitrogen than into the small cells of those deficient in this element. It is further pointed out that strictly parasitic fungi, e. g., the rusts, cease to develop in a very small complex of dead cells and therefore produce only limited necrotic areas, whereas those that appear to be able to live also on dead substances, represented by *P. viticola* and *Phytophthora infestans*, may kill large leaf areas. Thus the possibilities of development of a fungus (apart from questions of hereditary susceptibility or resistance) will depend to some extent on the capacity of the host for the rapid and adequate replacement of the substances withdrawn from it by the parasite so as to protect the infected parts from death.

Beauverie (J.). **Action du parasite sur la résistance du chondriome-plastidome, sa fragilisation et l'altération de la structure cellulaire.** [Parasitic action on the resistance of the chondriom-plastidom, its fragmentation and the alteration in the cellular structure.]—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1299-1311, 6 figs., 1929.

An account is given of the author's studies of the effects of

fungous parasites upon the internal structure of the host cell [*R.A.M.*, vii, p. 735]. A disturbance is brought about in osmotic pressure, a hypertonic condition is produced, and the protoplasm becomes finely granular and dies. The incursion of water then transforms the mitochondria and certain plastids into vesicles, which burst, leaving a few granules. The chloroplasts undergo granular degeneration, oil-drops forming from the pigment and globules from the albuminoid or lipoidal substratum of the plastid; these granules fuse into a few large globules, which may soon be resorbed.

In potato leaf roll the marked fragmentation of the chloroplasts possibly results from hypotonia following the transformation of the sugars *in situ* in the leaves into starch, this fragmentation resulting from the action of ordinary water.

The degeneration of the plastids may be effected experimentally with a degree of facility that depends upon whether they have been fragmented or not by parasitic action; this explains why the chloroplasts of potato leaves affected with leaf roll break up in the presence of ordinary water.

These data are discussed in relation to Marshall Ward's theory of the susceptibility and hyper-susceptibility of cereals to rusts (*Puccinia* spp.), and indication is given of the possible application of the author's theory of the fragmentation of the plastids to the study of resistance to fungal attack.

Newton (W.). **Report of the Dominion Field Laboratory of Plant Pathology, University of British Columbia, Vancouver, B.C.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 202–204, 1929. [Received May, 1930.]

No significant differences could be detected in either the diastase or invertase activity of potato tubers as a result of virus infection [cf. *R.A.M.*, vii, p. 340]. Certain oxidizing enzymes, however, appear to be more active in normal than in rugose mosaic-infected tubers, as judged by colour changes in the two types of tissue ground in a mortar. Normal tubers further seem to contain a compound, readily oxidized by weak permanganate under neutral conditions, which is not present to the same extent in those suffering from rugose mosaic. This tentative conclusion is based on the fact that a hot water extract of normal tissue will decolorize a weak potassium permanganate solution more rapidly than one from rugose tissue. The substance oxidized by permanganate is not reducing sugar, the quantities of which are frequently greater in diseased than in healthy tissue. Cores of rugose mosaic-infected tubers placed in a desiccator dried out more rapidly than similar cores of normal tissue. The dry matter content of diseased tubers was lower than that of normal ones.

Butler (O.). **Effect of size of seed used in commercial planting on the incidence of leaf roll and mosaic in Potatoes.**—*Journ. Amer. Soc. Agron.*, xxii, 1, pp. 75–76, 1930.

Experiments [the results of which are tabulated] were conducted at the New Hampshire Agricultural Experiment Station in

1923, 1925, 1926, and 1927 to determine the relative percentages of mosaic and leaf roll in small and standard size seed potatoes from the same source. It was found that, contrary to the general belief, the so-called 'seconds' (tubers $1\frac{1}{2}$ to $1\frac{3}{4}$ inches in diameter) constituted quite as good seed as the 'firsts' ($1\frac{3}{4}$ inches in diameter to 12 oz. in weight). There were no appreciable differences in the incidence of mosaic in the two classes, while as regards the more important leaf roll, the percentage of infection in five-ninths of the tests was less in the small seed than in the large, while in the remaining four-ninths it was greater. The increase in the percentage of leaf roll in the latter series was associated, except in one case, with a substantial incidence of net necrosis in the 'firsts', which therefore constituted seed of doubtful quality.

MacLeod (D. J.). **Report of the Dominion Field Laboratory of Plant Pathology, Fredericton, N.B.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 186–199, 2 figs., 1929. [Received May, 1930.]

There are stated to be two types of potato mosaic of economic importance in New Brunswick, viz., mild and rugose [*R.A.M.*, ix, pp. 51, 402]. The former is characterized by a slight dwarfing of the whole plant, distinct mottling, and abnormal unevenness of the leaf surface and waviness of the margin. Plants affected by rugose mosaic show marked dwarfing, a more diffuse type of mottling than the foregoing, and extreme unevenness of the leaf surface, accompanied by a tendency to brittleness, necrotic streaks or spots, dropping of the lower leaves, and premature death of the plant. Observations extending over four seasons have shown that *Macrosiphum solanifolii*, *Myzus persicae*, and *Aphis abbreviata* are chiefly responsible for the transmission of the virus diseases of potato under local conditions. An investigation of the effects of both types of mosaic on Green Mountain, Irish Cobbler, and Bliss Triumph potatoes showed that mild mosaic requires four to five seasons to render an average strain unproductive, the yield rate only being reduced from 10 to 30 per cent. during the first year, and no further appreciable losses occurring during the second and third seasons. Rugose mosaic is much more destructive, reducing the yield rate from 35 to 60 per cent. the first season, and rendering an average potato strain unproductive in two or three years. Of the three above-mentioned varieties, Bliss Triumph appears to be most susceptible to mild and rugose mosaic, and Irish Cobbler least so. The results [which are tabulated] of germination tests showed that mild mosaic exercised no appreciable effect on the rate of germination, whereas rugose mosaic delayed the process considerably even during the first season of attack, and caused extreme retardation in the second. Leaf roll did not cause any appreciable retardation of germination either in the first or second season, but spindle tuber produced a very detrimental effect, culminating in the suppression of germination in the second year.

Close spacing intervals (10 to 12 inches) were found to yield a much cleaner crop and a larger amount of tubers weighing 3 to 12 oz. than wide ones [ibid., ix, p. 332], and are therefore recommended for the production of certified seed.

The results of comparative experiments in the control of early and late blights of potatoes [*Phytophthora infestans* and *Alternaria solani*] by spraying with Bordeaux and Burgundy mixtures (4–4–40) and dusting with copper-lime (20–80) indicated that Burgundy mixture is most effective for this purpose and the dust least so. Both diseases appeared in the Bordeaux and copper-lime plots on 8th August, whereas no infection occurred on that sprayed with Burgundy mixture until a week later, and on 4th September the foliage in the latter plot was still green while that of the two former was almost entirely destroyed. Burgundy mixture cannot be safely used with lead arsenate in a combination spray owing to the occurrence of severe burning of the foliage, but calcium arsenate may be substituted without detriment. One of the chief difficulties in connexion with the preparation of Burgundy mixture was the unreliability of the sal soda used in its composition, but this has been largely surmounted by the commercial manufacture of certain brands which are virtually free from impurities. In addition to its high degree of toxicity (fully equal, if not superior, to that of Bordeaux mixture), Burgundy mixture does not produce a precipitate in the sprayer, nor does it stain the foliage to such an extent as Bordeaux, thereby facilitating the detection of the milder forms of mosaic.

GILBERT (A. H.). **Net-necrosis of Irish Potato tubers.**—*Vermont Agric. Exper. Stat. Bull.* 289, 36 pp., 12 pl., 6 figs., 1928. [Received April, 1930.]

This is a comprehensive account of the writer's investigations from 1926 to 1928 on the net necrosis disease of potatoes in Vermont [*R.A.M.*, viii, p. 331].

The disease is manifested by a brown discoloration of the phloem strands of the tuber, beginning at the stem end and progressing towards the bud. The brown strands consist of groups of sieve-tubes together with adjacent affected phloem parenchyma cells. These diseased strands, observed after the removal of the outer cortex, appear as a brown network. The first indication of necrotic changes in the tissues is the death and discoloration of the protoplasmic contents of the sieve-tubes and companion cells. The cell walls undergo chemical changes and disorganization; the centres consist of gummy masses which are very resistant to solvents. New cork-cambium cells are commonly formed around the necrotic centres. Microchemical tests showed that the changes in the necrotic walls involve accumulations therein of suberin, lignin, and pectin substances, accompanied by a high degree of resistance to cell wall solvents.

The results [which are tabulated and discussed] of field trials conducted during 1927 at Madison, Wisconsin, seemed to confirm the writer's hypothesis that net necrosis is a first-season tuber symptom following the initial infection of a healthy plant with the leaf roll virus. Aphids (*Myzus persicae*) were used for the transmission of the virus, being colonized on caged leaf roll plants and transferred to caged healthy ones. Necrosis occurred in significant amounts (up to 100 per cent.) in the cages containing infective insects, while none was present in the control cage. The

necrotic tubers produced leaf roll plants, while those from the control cage yielded healthy ones. Further confirmation was given to the theory that net necrosis is an early symptom of infection by the leaf roll virus by the fact that the former disease was prevalent in rows adjacent to leaf roll plants in an open field plot, while tubers from the leaf roll plants themselves showed no sign of net necrosis.

A bibliography of 58 titles is appended.

ELZE (D. L.) & QUANJER (H. M.). **Phloeemnecrose en netnecrose van de Aardappel in Amerika en Europa.** [Phloem necrosis and net necrosis of the Potato in America and Europe.]—*Meded. Landbouwhoogeschool Wageningen,* xxxiii, 8, 10 pp., 2 pl., 1929. [English summary.]

In Dutch potato varieties affected by leaf roll, phloem necrosis occurs only in the veins and stalks, whereas in American varieties it is also found as a first-season tuber symptom, under which form it is known as net necrosis [see preceding abstract]. This fact raises the question of the identity of the disease in Holland and America.

Apparently healthy Green Mountain, President, Roode Star, and Duke of York tubers were planted beside diseased (leaf roll) individuals of President, Bevelander, and a Roode Star seedling. Primary leaf roll symptoms developed in the plants exposed to infection. In the Dutch varieties phloem necrosis occurred only in the veins and stalks, while in Green Mountains the tubers were also affected, this being the first case of net necrosis observed by the authors.

American leaf roll was transmitted by *Aphis rhamni*, *Myzus persicae*, *A. fabae*, and *Psylliodes affinis* [*R.A.M.*, vii, p. 49] from diseased Green Mountain, Rural, and Irish Cobbler plants received from the United States to the Duke of York, Roode Star, and President varieties, in which phloem necrosis was produced only in the foliage and not in the tubers. These results would appear to prove the identity of leaf roll in America and Europe.

An attempt was made to induce the development of phloem necrosis in leaf roll tubers of Dutch varieties by planting the tubers partly buried in the soil in such a way as to allow the buds of the rose end to grow into rootless shoots, and those of the buried heel end to form roots and tuber-bearing stolons; in the mother tuber, functioning as a stalk, secondary xylem and phloem developed, and necrosis was then actually observed in the primary phloem strands. Healthy potatoes, similarly treated, showed no phloem necrosis.

KERLING (L. C. P.). **Microscopisch onderzoek van pseudonet-necrose en kringerigheid van de Aardappel.** [Microscopic investigation of pseudo-net necrosis and 'kringerigheid' of the Potato.]—*Meded. Landbouwhoogeschool Wageningen,* xxxiii, 10, 17 pp., 1 pl., 5 figs., 1929. [English summary.]

Burr's statement that lack of microscopical investigation is responsible for the prevailing confusion in the literature on sprain or internal rust spot and net necrosis [termed by Burr 'corky

bacteriosis'; *R.A.M.*, viii, p. 398] is thought to be due to ignorance of the work of Swellengrebel (*Arch. Néerland. Sci. Exactes et Nat.*, Sér. ii, xiii, p. 151, 1908) and other Dutch authorities. In the present paper the writer endeavours to show that microscopical investigation alone is insufficient for the differentiation of potato diseases of the necrotic type, since the response of the plant is identical, however divergent the cause of the necrosis.

Pseudo-net necrosis [see preceding abstract] is transmitted by seed tubers. 'Kringerigheid', on the other hand, occurs only on certain soils, developing during growth and appearing on the cut surface as concentric brown rings arising from some point on the skin, often a lenticel; it is not transmitted by the tubers [*R.A.M.*, v, p. 572]. The rings consist of necrotic cell groups similar to those found inside and outside the xylem in pseudo-net necrosis.

In the necrotic cells of plants affected by both diseases the starch grains are embedded in a brown mass, consisting of a membrane surrounding each individual grain and membranous deposits filling the intergranular spaces. These deposits are in contact with the discoloured cell wall and give the reactions for suberin, lignin, and pectin; the cell walls are more resistant to the action of Jeffrey's fluid and Eau de Javelle than the deposits, which take the colour of methylene blue, leaving the cell walls unstained. The membranous deposits are decomposed, giving rise to yellow oily drops, by treatment with 50 per cent. caustic potash at 100° C., and they have been shown to be fatty products of the protoplasts together with lignin and pectin material. When healthy living cells are vitally stained with neutral red by Guilliermond's method (*Amer. Journ. of Botany*, xvi, p. 1, 1929), the vacuoles take the colour, leaving the protoplast unstained. If, however, the protoplast is killed, it absorbs the colour, condenses, and undergoes a degeneration somewhat resembling that described above, in which the initial stages of membrane formation on the surface of the starch grains may be observed.

The tissue surrounding the necrotic spots reacts as potato tissue normally does in wounds [ibid., ii, p. 384], i. e., a wound phellem is found occluding the necrotic cells and is encircled by a wound phellogen, which in turn is surrounded by a wound phelloderm. This tissue of reaction is more extensively developed in kringerigheid owing to the more rapid progress of the latter disease.

Van Slogteren (E.). **The biological basis for the international movement of plants and plant products. International co-operation in scientific research and the international exchange of plants and plant products.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1343–1348, 1929.

After pointing out that the international exchange of plants and plant products cannot be interfered with by legislation without at the same time interrupting that general exchange of commodities which is vital to the economic welfare of the world, the author urges that all restrictions on plant importations should be made as light as possible. He recommends that the safeguarding from disease of the home crops in each country should be in the hands only of phytopathologists who, if any parasite likely to damage

home produce is found on imported plants, should clearly demonstrate this to their colleagues in the exporting country. Should their objections be sustained, the exporting country must remove them or incur a temporary exclusion of the product concerned, this to be lifted when it has proved that the danger no longer exists. In this manner, all quarantines would become specific, local, and temporary.

JONES (L. R.). **Essential factors in destructive plant disease development.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1284–1298, 1 chart, 1929.

In view of the comparative inadequacy of quarantine measures to arrest the spread of infectious diseases of plants, the author emphasizes the need of making detailed studies of the full cycles of development of pathogen and host and of the extent, causes, and effects of variability in infection considered in relation to environment. The points raised are illustrated by references to various common epidemic diseases of plants and in particular to the studies made by Keitt and others at Wisconsin on the epidemiology and control of apple scab (*Venturia inaequalis*) [*R.A.M.*, vi, p. 299].

GÜSSOW (H. T.). **International plant disease legislation—is it practical?**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1334–1342, 1930.

Discussing from various aspects the effectiveness or otherwise of plant legislation and port-of-entry inspection services, the author queries whether the benefits derived therefrom may advantageously be set against those which might reasonably be expected to follow the new introduction of a plant product, and points out that whereas domestic quarantines may prove to be of use, foreign quarantines involving the complete prohibition of some product are biologically unsound, ineffective in practice, and bristle with economic and international difficulties. He favours the biologically open door, advocates the establishment of an international committee to discuss the merits of the regulations in force in the various countries and recommends that those which are too severe should be modified, and others, which are no longer biologically justified, discarded. Inspection services at the ports of landing will gradually come to an impasse, their cost of maintenance being out of all proportion to the benefits derived.

BUTLER (E. J.). **International plant disease legislation as it affects the British Empire.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1349–1353, 1929.

In view of the fact that in many of the exporting Dominions and Colonies of the British Empire the national prosperity depends upon the continued activity of a single industry (e.g., rubber-growing in Malaya) for which it might be impossible to find a substitute, the author considers that there is no likelihood of Empire mycologists endorsing as a body any proposal to relinquish their powers of imposing severe restrictions, amounting in certain cases to total prohibition, on the free circulation of living plants.

The interception of diseased plants at the port of entry or the prevention of their arrival has sound biological justification; the adequacy of preventive measures varies from country to country, but there is ample reason for believing that every part of the British Empire is, in fact, satisfied that by taking the necessary precautions it has kept out certain diseases which otherwise would have gained admittance. As regards the possibly excessive nature of the existent precautionary measures, the author considers that consignments showing a high percentage of a disease already present in the importing country should be refused entry, but not those containing only a small amount of diseased material; in general, the number of kinds of plants prohibited on account of specific disease should be limited to those affected by really dangerous parasites.

It is considered probable that restrictive measures in the British Empire have now reached their maximum severity, so far as those countries are concerned whose export consignments are reasonably clean.

An Ordinance relating to noxious weeds and diseases of plants. Fiji. No. 21 of 1929.

By the Noxious Weeds and Diseases of Plants Ordinance, 1929, it becomes lawful for the Governor of Fiji in Council to prohibit the importation of any plant generally, or of any specified plants from any specified place, either absolutely or under conditions. Any diseased plant found by a responsible official on a vessel visiting the island or on shore or which there is reason to believe has been imported in contravention of such prohibition shall be destroyed immediately. When a vessel carrying plants for importation into Fiji arrives at the port of entry, the whole or part of the plants as directed by an inspector shall be landed for examination and treatment or destruction, if necessary, and must not be taken out of official custody until duly certificated. When plants are posted to Fiji, the importer must at once notify an inspector, the postal officer reporting their arrival within 24 hours, and the importer cannot take possession of them without an inspector's certificate. Every consignment of imported plants must be accompanied by a certificate signed by a responsible officer of the country of origin or dispatch of the plants certifying them to be free from disease, though the Governor in Council may by order declare that this shall not apply to any specified plant from any specified country. The Governor in Council may make regulations for the inspection or condemnation of plants, for controlling the importation of any plant that is diseased or likely to become so, and for the licensing and inspection of nurseries or other places in which plants are reared for disposal.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

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QUANJER (H. M.) & BOTJES (J. G. O.). **Aardappelziekten van het 'stippelstreep'—en 'topnecrose'—type en het vraagstuk der latentie en physiologische specialisatie.** [Potato diseases of the 'streak' and 'top necrosis' type and the problem of latency and physiological specialization.]—*Meded. Landbouwhoogeschool Wageningen*, xxxiii, 7, 44 pp., 9 pl., 1929. [English summary.]

An analysis, by Murphy's method of core grafting [*R.A.M.*, v, p. 442], of the different virus diseases of potatoes collectively known as 'streak', has facilitated their classification into eight distinct types. (1) Atanasoff's stipple-streak [ibid., ii, p. 285] occurs in the Dutch variety Paul Kruger (known as President in England), in the Scotch Duke of York (Eersteling in Holland), and the American Green Mountain, all of which show long, dark stripes on the petioles and stems and angular, brownish-black spots, varying in number and size, along the leaf veins. The tubers develop the symptoms of 'eye disease' or 'blindness'; depressed brownish-black blisters are formed on the surface, near or between the eyes, which are ultimately killed. Secondary symptoms include heavy wrinkling and streaking, reduced growth, and premature death of the shoots. This type of streak occurs in a semi-latent form, more or less resembling Murphy's 'crinkle' [ibid., i, p. 307; viii, p. 592], in the Dutch variety Bravo and the American Rose 4, and in a semi-latent form, approximating to mild mosaic [ibid., viii, p. 592], in the Dutch Eigenheimer. None of the varieties harbouring the disease in a semi-latent form shows tuber symptoms. Streak occurs in an entirely masked form in the old Dutch varieties, Zeeland Blue, Bloemgraafjes, and Gladblaadjes. When Zeeland Blue was grafted on Duke of York and Green Mountain, the plants died at the beginning and middle of July, respectively.

(2) Koksiaan stipple-streak in the English variety May Queen (Dutch name Koksiaan) is characterized by spots surrounding the veins but not extending to the petioles and stems, while the tubers are also unaffected. Grafting on President resulted in a somewhat modified form of streak which did not attack the tubers.

(3) Noordeling stipple-streak, occurring on the Dutch variety Noordeling, results in the production of symptoms resembling crinkle when the variety in question is grafted on Bravo. This

type of crinkle, however, is quite distinct from that mentioned under (1), in which the wrinkling and mottling are more accentuated. When grafted on Duke of York, both diseases are indistinguishable from Atanasoff's stipple-streak, also as regards tuber symptoms. When the latter disease is grafted into Noordeling, the resulting symptoms include more leaf drop [ibid., iii, p. 415] than those typical of the Noordeling disease in the field.

(4) Stipple disease of Eersteling is characterized by the development of brownish-black leaf spots, less angular than those of Atanasoff's streak, unaccompanied by stripes on the petioles and stems or by tuber symptoms. This form of streak appears later in the season than stipple-streak and is less serious, recurring annually in the progeny without killing the plants. Transmitted to President and Green Mountain, it causes symptoms somewhat resembling those in Duke of York.

(5) Top necrosis latent in Duke of York. Several types of top necrosis, a virus detected as a result of core grafting in some Scotch, American, and Dutch potato varieties, have been found to exist. This virus produced a disease in other Dutch varieties which had never before been observed in Holland in the field. When tubers of apparently healthy plants of the Duke of York variety are grafted on those of Bravo, Bloemgraafje, Roode Star, and Industrie, the tops of the plants are killed by a severe streak, while the stems and tubers show internal necrosis. These symptoms resemble those of yellow dwarf [ibid., i, p. 449 *et passim*]. Grafting with Duke of York produces mosaic in Zeeland Blue, but Eigenheimer shows no symptoms after similar treatment. In the field, Duke of York exhibits no symptoms and thus is a perfect carrier. When this variety is grown in the greenhouse a mild form of mosaic may be observed.

(6) Top necrosis latent in Green Mountain. Graftings similar to those made in the United States [ibid., iv, p. 692] with apparently healthy Green Mountains on the President, Bravo, Roode Star, Bevelander, and Kerr's Pink varieties resulted in a disease agreeing entirely as regards foliage symptoms with the top necrosis described under (5), while the tubers showed necrosis on and between the eyes and in the interior. Externally this tuber necrosis somewhat resembles the eye diseases occurring as a concomitant of stipple-streak. In the Zeeland Blue variety this type of top necrosis is manifested as mosaic, while in Eigenheimer and Duke of York it is completely masked.

(7) Top necrosis latent in the Dutch variety Monocraat. When this variety is grafted on Zeeland Blue or Eigenheimer, or on Duke of York via Eigenheimer, the plants develop the typical symptoms of top necrosis described under (5). It is probable, however, than the Monocraat type of top necrosis is distinct from (5), since the former attacks Duke of York, which in the latter is merely a carrier. A disease apparently identical with Monocraat top necrosis occurs in a masked form in Roode Star. When some strains of the latter variety are grafted on President, Zeeland Blue, Bintje, a seedling of Roode Star, or Industrie, a disease occurs which is probably identical with that for which Monocraat is a carrier.

(8) Green Mountains affected by yellow dwarf were obtained from Dr. E. S. Schultz and Dr. K. H. Fernow. As stated above, the Dutch top necrosis resembles the American descriptions of yellow dwarf in aerial and tuber symptoms, but the diseases are evidently distinct, since yellow dwarf failed to develop in the cool summer climate of Holland. According to Fernow, the development of this disease is favoured by growing the plants at 15° C. until they are 5 to 6 inches high and then transferring them to a temperature of 25°.

A table is given showing the reaction of the various differential hosts to the different types of streak enumerated in this paper.

Quanjer (H. M.), Thung (T. H.), & Elze (D. L.). **'Pseudonet-necrose' van de Aardappel.** [Pseudo-net necrosis of the Potato.]—*Meded. Landbouwhoogeschool Wageningen*, xxxiii, 9, 10 pp., 1 pl., 1929. [English summary.]

In some strains of the Roode Star potato variety an internal parenchyma necrosis occurs in the form of numerous brown spots both inside and outside the xylem ring; the condition is transmitted by seed tubers to the progeny. It infects adjacent plants in the field and has been transmitted by the aphid *Myzus persicae* from Roode Star to Duke of York. A similar disease has been described by Fruwirth under the name of 'hereditary sprain' [*R.A.M.*, ix, p. 199].

No symptoms of 'pseudo-net necrosis' are apparent on the foliage. Atanasoff regarded it as identical with American net necrosis [ibid., ix, p. 477], and finding that it occurred in plants simultaneously infected with aucuba mosaic, he considered it as a tuber symptom of the latter disease [ibid., vi, p. 311]. However, the examination of material of Sutton's Early Regent from Ireland and of Green Mountain from America revealed the presence of aucuba mosaic without pseudo-net necrosis, while, conversely, the latter condition has been found in plants free from the former. Pseudo-net necrosis develops during storage, its incidence being increased by a rise in temperature from 10° to 20° C., especially in tubers originating in sandy soil. The President and Roode Star varieties are highly susceptible to this disease, which is shown in the former variety by necrotic spots on the outside of the skin. The symptoms are less conspicuous in the Eigenheimer, Thorbecke, and Industrie varieties, and apparently absent in Duke of York, May Queen, Bintje, Bravo, Triumph, Monocraat, Bevelander, Zeeland Blue, and Alpha; there are indications, however, that one or more of these varieties may actually harbour infection and serve as carriers. Owing to the late development of pseudo-net necrosis, it may readily escape attention and thus be perpetuated by the seed.

Löhnis (Marie P.). **Correlation between the host anatomy and the degree of susceptibility for Phytophthora infestans in Potato tubers.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1279–1283, 1929.

In this paper the author summarizes the results of her investigations into the relationship existing between the anatomy of potato

tubers of different varieties and their susceptibility to *Phytophthora infestans*, an account of which has already been noticed from another source [*R.A.M.*, iv, p. 761.]

Schlumberger [O.]. **Kartoffelfäulen, ihre Ursachen und Verhütung.** [Potato rots, their causes and prevention.]—*Mitt. Gesellsch. für Vorratsschutz*, vi, 1, pp. 10–15, 1930.

Popular notes are given on the etiology and control of the rots of stored potatoes caused by late blight (*Phytophthora infestans*), white rot (*Fusarium* spp.), and blackleg [*Bacillus phytophthorus*], the estimated annual loss from which in Germany is 14 per cent. of the harvest, equivalent to M. 224,000,000.

Reyes (G. M.). **A preliminary report on the stem-rot of Rice.**—*Philipp. Agric. Rev.*, xxii, 4, pp. 313–331, 9 pl., 1 fig., 1929.

An investigation of the stem-rot disease (*Sclerotium oryzae*) of irrigated rice in the Philippines [*R.A.M.*, viii, p. 635] in 1927–8 and 1928–9, showed that the amount of damage is directly related to the prevailing weather, and is favoured by warm and moist conditions. Other predisposing causes are the presence of abundant stagnant water, poor preparation of the soil, heavy applications of nitrogenous fertilizers, and thick planting. There would seem to exist three forms of *S. oryzae* in the Philippines, provisionally designated as A, B, and C; inoculation experiments indicated that all three are pathogenic to rice, although to a varying degree, their virulence decreasing in the order given.

The varieties Binan, Ramai, and Elonelon were the most resistant to stem rot under the conditions prevalent in Pampanga, while in Rizal the best varieties were Ramai, Arabon, Kinatuday, Elonelon, Magcumpol I, Mancasar Str. 3, and Guinangang Str. 1. In general, it was found that late varieties are more resistant to the disease than the early ones.

Tayler (V. A.) & Stephens (J.). **Native Rubber in the Dutch East Indies. Report to the Rubber Growers' Association.**—48 pp., 29 figs., 1 map, London, Rubber Growers' Association, 1929. [Received May, 1930.]

During 1929 the authors conducted a special investigation of the native rubber plantations at Pontianak and Banjermasin in Borneo, and Palembang and Jambi in Sumatra. Root disease (*Fomes lignosus*) was rare on young rubber, the land in most cases having been cleared of jungle at least twice; pink disease [*Corticium salmonicolor*] was prevalent, but less severe than in Malaya. Except in the Banjermasin area *F. lignosus* and *F. pseudoferreus* were very common on much of the rubber planted before 1920, in some places every tree in areas of one to three acres being either dead or dying, probably on account of the dense stands. The attacks are favoured by the fact that much of the rubber has reached an age when *F. pseudoferreus* becomes troublesome, and that no treatment is given. But on some lands, such as lalang [*Imperata arundinacea*] and scrub lands that had been cleared several times, the incidence of root diseases was slight.

Brown bast was prevalent everywhere, and was present on a

high proportion of the trees except those growing slowly on poor soil. The local tapping methods favour attack, for when a tree becomes diseased, either another cut is opened or part of the bark still capable of yielding latex is cut. Later, such trees cease to give sufficient latex to make tapping even by native methods worth while, but no evidence was obtained that every rubber tree finally develops brown bast as a result of the irritation caused by tapping.

Mouldy rot of the tapped bark [*Ceratostomella fimbriata*: *R.A.M.*, ix, p. 405], was present at Palembang, and in Borneo a fungus growth on the tapped surface that simulated the disease was also noted, though stated to disappear in the dry season; the condition nowhere produced the disastrous effects which result from it when neglected in Malaya.

[This paper is summarized in *Malayan Tin and Rubber Journ.*, xix, 1, pp. 9–12, 1930.]

BOBILIOFF (W.). **Onderzoekingen over den meeldauw bij Hevea brasiliensis.** [Investigations on mildew in *Hevea brasiliensis*.]—*Arch. voor Rubbercult. Nederl.-Indië*, xiv, 1, pp. 15–51, 6 figs., 1 graph, 1930. [English summary.]

This is an extended account, accompanied by tables, of the author's recent investigations on *Hevea* rubber mildew (*Oidium*) [*heveae*] and its control in Java, the salient features of which have already been noticed from another source [*R.A.M.*, ix, p. 336]. Among the additional points of interest in this paper are the statements (*a*) that dusting with sulphur gave an extraordinary stimulus to flowering, which was observed in over 90 per cent. of trees in the treated gardens; and (*b*) that 16 per cent. of the trees lost their leaves as a result of the second attack of the fungus and 3 per cent. from the third outbreak of infection.

TENGWALL (T. A.). **Bestrijding van meeldauw op Hevea door verstuiving met zwavelpoeder van vliegmachines uit.** [Control of mildew on *Hevea* by dusting with sulphur from aeroplanes.]—*Arch. voor Rubbercult. Nederl.-Indië*, xiv, 1, pp. 1–14, 1930. [Condensed English translation.]

Some of the outstanding results of the experiments, conducted in 1928–9 on various Java *Hevea* rubber estates in the control of mildew (*Oidium*) [*heveae*] by dusting with sulphur from aeroplanes, have already been summarized by O. de Vries [*R.A.M.*, ix, p. 337]. In this paper further details are given. In 1928 tests on an isolated plantation began on 28th August, and on this and three subsequent dates, up to 12th September, 20 flights in all were made, the sulphur used altogether amounting to 120 kg. per hectare. The trees were well covered and the mildew checked for a time; by the end of October there was a good deal of mildew but no leaf fall had occurred. In 1929 two plantations were each dusted once, on 11th–15th July and 8th–9th August, respectively, the amount given to the former being 25 kg. per hect., and to the latter 40 kg. Both effectively checked the development of mildew for an appreciable period. The cost for an application of 25 kg., including flying costs and cost of the sulphur, came to about Fl. 6 per hect.

Ware (W. M.). **Experiments on the production of diseased shoots by the Hop downy mildew, Pseudoperonospora humuli (Miy. et Takah.), Wils.**—*Ann. of Botany*, xliii, 172, pp. 683–710, 1 pl., 6 figs., 1929.

To ascertain whether the spiked growths produced on hops infected with *Pseudoperonospora humuli* are formed internally by mycelial invasion or externally by spore infection, experiments were conducted during 1928, at Wye, Kent, in which 31 buds or very young shoots on the root-stocks of 21 pot plants of the susceptible Hallertau, Aischgrund, and Tutsham varieties were inoculated [by a method which is described] with a suspension of zoospores [*R.A.M.*, ix, p. 59].

The results [which are fully described, discussed, and expressed in tabular form] showed that six shoots remained entirely healthy, three showed only leaf infection, while twelve became infected systemically. Of these twelve, three showed dwarf spikes, seven showed typical spikes, and two showed late spikes. In six of the plants on which the basal spikes were produced the systemic infection spread and invaded the tissues of the root-stock.

In some of the inoculations the rudimentary laminae of the shoot leaves were visible and these appeared to be readily infected by the zoospores, though no systemic infection resulted when the mycelium did not succeed in growing down the petioles. All the shoots which showed any trace of laminae when inoculated became infected. A high proportion of the closed buds resist infection (of the 12 buds inoculated when without laminae, 6 remained healthy). There were no varietal differences in the type of infection, except that dwarf spikes were found only on Hallertau, a fact which may be correlated with the extreme susceptibility of this variety.

The possibility that the six plants in which invasion of the root-stock occurred might have already been penetrated by mycelium which had hibernated since the previous year is regarded as unlikely, since had such been the case it seems reasonable to expect (assuming that the mycelium can grow up from the set into the shoot) that other shoots than the inoculated one would also have become spiked on each plant, which was not the case. The author, however, considers that, setting aside the possibility of infection by the products of oospore germination, it is reasonable to suppose that the first spikes of the season may be caused by mycelium which has hibernated in the bud or the root-stock. Zoospores can be produced profusely on the first spike of the season, which, being situated immediately over the root-stock, is in the best possible position for distributing zoospores in the soil around the latter. Another source of conidia, which might be carried to the soil, is the 'angular spot' stage of the disease.

In a further test an attempt was made to produce terminal spikes on healthy lines growing in the open, the extreme tips of 13 stems, each on a separate plant, being inoculated as in the previous experiment. Nineteen days later, typical terminal spikes were produced on three plants. Four of the rest remained healthy, but in the other six there were symptoms of disease at one or more of the nodes, consisting of shortened and thickened petioles, short laterals and, in a few instances, of yellow streaks on the laminae

of one or both leaves at the node. Examination of these established that penetration occurred some distance below the growing point and that the mycelium did not reach the apex. Intermediate lengths of healthy tissue between the infected parts were found on two of the plants, as in nature. A remarkable result of the inoculation of the growing tip was that lateral spikes were sometimes formed, while buds which should have given rise to laterals were sometimes killed outright. It is thought that this is probably due to isolated infection at one node or to the spread of mycelium into it from a node above or below.

In three plants there was a growth of healthy laterals and leaves from an infected node, and in one of them, and one other plant, the growth of one healthy lateral and leaf on one side only of an infected node, as met with under natural conditions.

There was no reduction in the length of those internodes which were completely invaded by hyphae, and the invasion of one or two internodes appeared to be no hindrance to the stem continuing its growth to the top wire, 12 feet from the ground.

LEBEDEVA (Mme L. A.). **Über Vorkommen und Bekämpfung von Sphaerotheca macularis Mgn. f. humuli Lév. und von Pseudoperonospora Wilson im Kostroma-Gouvernement.** [On the occurrence and control of *Sphaerotheca macularis* Mgn. f. *humuli* Lév. and of *Pseudoperonospora* Wilson in the Kostroma Government.]—*Zentralbl. für Bakt.*, Ab. 2, lxxx, 1–7, pp. 64–70, 1930.

In connexion with a series of experiments [the results of which are fully described] in the control of hop mildew (*Sphaerotheca macularis* f. *humuli*) [*S. humuli*: *R.A.M.*, viii, p. 514] and downy mildew (*Pseudoperonospora humuli*) in the Kostroma Government, Russia, the writer for the first time observed the occurrence of the so-called 'spiked' growths caused by the latter fungus [see preceding abstract]. An examination of the diseased shoots showed that they generally measured 8 to 15 cm. in length and 0·25 to 0·5 cm. in thickness. The internodes are greatly shortened, measuring only 1 to 2 cm. in length. The leaves are small, often clustered in rosettes, and the leaflets irregular, shrunken, and semi-chlorotic, not exceeding 3 to 4 cm. in diameter. The lower leaves, sometimes up to a third of the height of the plant, shrivel extensively. In the cases under observation infection was most severe in the gardens where stable manure was left to rot on the ground. *P. humuli*, which on 30th June, 1928, was in the initial stage of conidial formation, developed rapidly during the succeeding fortnight. The development of the spherical oospores (30 to 45 μ in diameter) could be followed in the deeper parenchymatous layers as well as on the surface of the tissue bundles. *S. humuli*, on the other hand, did not make its appearance until July and at first developed very slowly. During the second part of July both diseases assumed an epidemic character owing to the persistent rain and night mists. It was therefore impossible to form a definite opinion as to the relative efficacy of the various fungicides tested [full details of which are given], but promising results were obtained with calcium pentasulphide at different concentrations in

the case of both diseases, while the experiments with Bordeaux mixture against downy mildew require to be repeated.

GIRZITSKA (Mme Z. K.). Конидиальная стадия **Pleospora papaveracea Sacc.** [Conidial stage of *Pleospora papaveracea* Sacc.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January, 1928*], pp. 172–173, 1928. [Received April, 1930.]

The author states that when spores of *Pleospora papaveracea* were cultured on 2 per cent. agar-agar with a decoction of gooseberry leaves they produced short chains of conidia of the *Dendryphium* type, measuring 25 to 35 by 3 to 5 μ. In a hanging drop conidiophores with spores of this type were observed emerging from the cells of *P. papaveracea* spores. Inoculation of uninjured leaves of the opium poppy (*Papaver somniferum*) with the conidia gave negative results, but when the leaves were slightly scratched infection ensued, as shown by the formation of diffuse yellow spots followed by the drying up of the infected leaves, which then bore a small quantity of spores; the mycelium then spread to the stems, on which perithecia of *P. papaveracea* were formed in the following autumn; no perithecia were formed on the leaves, in spite of repeated inoculation. The conidia were identical with those of *Dendryphium penicillatum* Fr., but the conidiophores were shorter and of a lighter colour than those of the latter species.

LOBIK (A. I.). Обзор микологической флоры Терского округа. [Review of the mycological flora of the Terek region.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January, 1928*], pp. 179–180, 1928. [Received April, 1930.]

In this paper the author attempts, on the basis of his systematic investigation from 1921 to 1927, inclusive, of the fungal flora in the Terek region [North Caucasus; *R.A.M.*, xiii, p. 810], to draw some general conclusions on the interdependence between local ecological conditions and the incidence and severity of the attacks of some parasitic fungi on field crops, forest trees, and the vegetation in general. He shows that the outbreak and development of epidemics caused by representatives of the Peronosporaceae, Erysiphaceae, Uredineae, and some other families, always follow a well determined sequence, although with some variations from year to year, due to the particular atmospheric conditions of the season concerned. Notes are also given on the biological significance of the regional distribution of some species, e.g., *Tilletia caries* and *T. foetens* on wheat. So far the investigation has shown the existence in the region studied of 1,257 species of parasitic fungi, the distribution of species according to the type of vegetation being as follows: 526 in forests, 176 in gardens and orchards, 206 in meadows, 131 in cultivated fields, and 47 species in denuded rocky ground.

Tropova (Mme A. T.). Грибные заболевания новых культур и попытка выявить меры борьбы. [Fungal diseases of newly introduced crops and endeavours to find means for their control.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January, 1928*], p. 188, 1928. [Received April, 1930.]

Observations made in 1926 on the incidence of fungal diseases in new crops which have been recently introduced in the Don Region [south Russia], including castor (*Ricinus communis*), showed that under local conditions this plant suffers severely from parasitic fungi, the economic importance of which is in the following decreasing order: *Cercospora* [*Cercosporina*] *ricinella* with an incidence of up to 34 per cent., *Phytophthora parasitica* (22 per cent.), *Macrosporium cavarae* (20 per cent.), *M. nigricans* (16 per cent.), *Alternaria tenuis* (10 per cent.), *Botrytis cinerea* (8 per cent.), and *Rhizoctonia* sp. (1·1 per cent.). Experiments in 1927 showed that disinfection of the seeds with a higher concentration of formalin than usually used for seed disinfection considerably reduced the incidence of these diseases and stimulated the germinability of the seed and the subsequent growth of the seedlings.

In 1927 castor beans were also attacked by *Rhizopus nigricans* and an undetermined species of *Fusarium*.

Da Camara (E. De S.). **Contributiones ad mycofloram Lusitaniae. Centuries VIII et IX.** [Contributions to the mycoflora of Portugal. Centuries VIII and IX.]—*An. Inst. Super. Agron.*, iii, pp. 59–141, 103 figs., 1930.

The present series of Portuguese fungi includes Phycomycetes, Ascomycetes, rusts, smuts, and imperfect fungi and contains descriptions of thirty new species, and records of one hundred species new to the Portuguese flora [cf. *R.A.M.*, viii, p. 812]. Amongst the latter is a record of sugar-cane smut (*Ustilago sacchari*) [*U. scitaminea*].

Faull (J. H.). **The morphology, biology, and phylogeny of the Pucciniastreae.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1735–1745, 1 diag., 1929.

A brief account is given of the results obtained by the author and his associate workers in their investigations into the Pucciniastreae as defined in Sydow's 'Monographia Uredinearum'. The group contains nearly 75 species in 8 genera, of which the life-history is known in about one-third, all heteroecious with the aecidial stage on conifers, especially on *Abies*. The material studied is listed, and the new species or hitherto unrecorded stages obtained by the author and his collaborators during several years' study in the field and in culture on the living plant are tabulated. General notes are given on the morphology and biology of these rusts. A table is also given showing the results of numerous culture experiments on living plants. As regards the possible phylogeny of the Pucciniastreae, the evidence as a whole [a brief discussion of which is given] indicates that *Uredinopsis* appears

to be the most primitive genus, with *Milesina* as a close relative. A brief discussion is also given of the probable relationships of the Pucciniastreae to the other sub-families of the Melampsoraceae.

Shear (C. L.). **Mycological nomenclature.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1657–1660, 1929.

In considering the question how to attain the greatest uniformity and stability in the use of generic and specific names the author points out that the essential purpose of nomenclature is to provide a convenient, accurate means of designating groups of living organisms, and not to give credit to distinguished botanists. The priority principle is purely academic and should to a great extent be discarded. The use of Latin binomials should be so uniform that a citation of the author should not be necessary to make the application of the name clear. From the standpoint of stability and uniformity the change of established, if inappropriate, names is very undesirable, this also applying to changes made on account of priority. In naming fungi general usage should be followed, recourse being had in difficult cases to a committee of mycologists. These having chosen a name, it should be generally adopted and not subject to change. This plan should be applied to all the large, important genera and species; in the case of the others, where little inconvenience or change would be caused, priority could be followed.

Ramsbottom (J.). **Botanical nomenclature in relation to mycology.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1661–1666, 1929.

The author discusses some general problems in mycological nomenclature and points out that some confusion exists between the principles of nomenclature, the rules for applying them, and the recommendations made to prevent future complications. He considers that mycologists must subscribe to the International Rules of Botanical Nomenclature, since in order to eliminate ambiguity international rules are essential. Rules which cannot be enforced, such as that by which diagnoses are invalid unless in Latin, should not be made, and rules should be sharply differentiated from recommendations. All botanical journals should agree to insist on their contributors conforming to the rules.

Being convinced of the necessity of continued changes in nomenclature as taxonomic progress advances, the author suggests that to prevent the premature adoption of rules, any alteration or addition suggested should be brought forward at an international congress, one or more botanists then being deputed to report what results would be likely to follow its adoption. A decision would be made after a consideration of this report. Doubtful cases of the interpretation of rules should be referred to the International Committee.

Difficulties encountered in applying the type-method to mycology should be cleared up by submitting them to mycologists in the form of a questionnaire.

Referring to the unsatisfactory vagueness prevalent as to what constitutes a species, the author states that in the Fungi Imper-

fecti the term species has a different meaning from that applied to completely known forms. The binomial of a completely known species should include its conidial form or forms; where only conidial forms are known these might be called form-genera and form-species.

In discussing how best to precise diagnoses drawn up from cultures the author refers to the problem presented by the infra-specific groups such as varieties, strains, and the like, and considers that if these different categories are definable, their occurrence must be recognized in taxonomy and nomenclature. It will be necessary to decide what ranks are to be recognized and what method of nomenclature is to be used.

KAUFFMAN (C. H.). **Mycological nomenclature.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1669–1672, 1929.

Emphasizing the waste of time involved in searching for historical data in botanical taxonomy as well as the amount of space taken up by such data in publications, the author considers that the object to be aimed at is to make the names of plants as stable as possible. The chief cause of the present instability is the unqualified application of the principle of priority. Qualification for each group of plants is the only method likely to bring even approximate concordance. Further, under American conditions, the rule requiring a Latin description of a new species is unwise and uncalled for; an easy solution to this difficulty would be the setting up of a central translation bureau. The importance attached to the type-specimen is considered to be excessive.

CUNNINGHAM (G. H.). **A defence of the morphological classification of fungi.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1713–1717, 1929.

In support of his contention that fungi should be classified according to their morphological characters, the author points out that according to a biological classification the fungi would fall into three main groups, (1) those readily grown upon culture media, (2) those cultivated only on the living host, and (3) those which cannot be cultured by present methods. As regards the first group, the media used generally consist of vegetable decoctions which vary with the conditions under which they are prepared and the sources from which they are obtained. Certain pathogens maintained in culture tend to lose their pathogenicity, with the result that species based on biologic behaviour towards their host (e. g., showing parasitism) would gradually lose their one specific character. Finally, the complicated technique necessary in the delimitation of species by cultural characters has the increasingly serious effect of being restricted to a few specialists.

The second group is limited to the Uredinales and the Erysiphaceae, and considerable confusion exists as to the specific names to be applied to most of the cereal rusts; should specific delimitation of fungi on biologic forms be accepted in the classification of the Uredinales, the biologic forms of *Puccinia graminis* must be given specific rank, which would serve no useful purpose, but only further confuse the systematics of the species. A second form of biological

classification of the Uredinales, by which *Puccinia* and *Uromyces* are split into several genera, according to the presence or absence of different spore forms in the cycle, is used in the 'North American Flora', and should such a practice become accepted, then *P. graminis* must be separated into two species, as the full cycle occurs in Europe, whereas in New Zealand and Australia the aecidial stage is lacking. *Ustilago nuda* and *U. tritici* are usually maintained as distinct species, but the author has shown them to be morphologically identical [*R.A.M.*, iv, p. 248]. As regards those fungi which it is not possible to obtain in culture, the pathologist would be forced to classify upon morphological characters.

In the author's opinion, a solution of the problem lies in a more concise monographing of species of genera occurring in any one region, redescribing the old species so that they would be readily recognizable, and arranging them by morphological characters.

BUTLER (E. J.). **The delimitation of species of fungi on physiological grounds.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1590–1597, 1929.

The author discusses the tendency to distinguish species of obligate parasites such as the rusts, smuts, and mildews by their ability to attack only certain hosts rather than by morphological characters, and the frequency with which in fungi that can be grown on artificial media, species are founded on certain growth characters or some biological or even biochemical peculiarity.

There are, however, signs of a reaction against the multiplication of species on biological characters alone. Three distinct tendencies are recognizable in the classification of the kinds of fungi under consideration: the older, purely morphological one, the almost purely biological one, and that which takes both factors into account. Certain evolutionary considerations offer guidance as to which tendency should be followed.

The importance still attached to adaptive factors in evolution supports the view that the colonizing of a new host by a rust or mildew may lead not only to special biological characters but also to morphological changes which may become permanent. In this manner, a stage may arise when it becomes a question whether such adaptive modifications justify specific rank.

Adaptive characters may fluctuate rather freely, perhaps as a result of environmental changes. Saltants sometimes differ in virulence from the parent strains, and there are various ways in which a fungus may change its host range. Hence it is difficult to admit that biological specialization alone affords a sufficient basis for distinguishing species.

Also, in the case of moulds like *Penicillium* and *Fusarium* cultural characters cannot be given specific value. The amount of aerial mycelium, rate of growth, zonation, colour, amount of sporulation, septation, and even, to some extent, the size and shape of the spore can be made such that, if constant, they would denote distinct species; yet all can be derived from a monospore, or a single hyphal tip, culture, intermediate forms exist, and each can be made by changes in the environment to resemble the other.

In some cases it would appear that morphologically good species, recognizable as such in nature, can be 'stretched' in culture so as to overlap.

If it be admitted that there is not, in nature, any pure, invariable, homogeneous species, that habit can modify the facies of a species, so long as it endures, that morphological characters are less readily modified by environment than are physiological ones, and that convenience is often the best guide showing where to draw the line between different species, then the morphological basis of classification becomes preferable except in cases such as the cereal loose smuts, where usage and convenience may outweigh morphological considerations.

BRIERLEY (W. B.). **Variation in fungi and bacteria.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1629–1654, 1929.

After surveying the present position of genetic study the author gives a brief critical account of genetic phenomena, concepts, and terminology in groups of organisms other than bacteria and fungi. The two last-named groups are then considered, a critical analysis being made of the phenomena of variation described. These may be classified on a basis of morphological and physiological criteria which arranges the data in phenotypic values, or they may be classified according to their appearance and behaviour, a method which arranges the data in genetic values. Correlations between the two systems of classification are discussed. The types of variation in fungi and bacteria classified on the genetic basis are considered in relation to the processes of growth and reproduction. Fungi and bacteria are compared with other organisms in respect of the types of genetic phenomena exhibited, the interpretation and classification of these types, the genetic concepts which emerge, and the terminology adopted. The paper concludes with a discussion of the avenues and directions of genetic research on fungi and bacteria.

KAUFFMAN (C. H.). **Klebs' theory of the control of developmental processes in organisms, and its application to fungi.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1603–1611, 1926.

Investigations conducted to test the validity of Klebs's views on the nature and potentialities of organisms, with special reference to his statement that living cells are influenced only by the specific structure and the internal and external conditions, confirmed the principle of constancy implied in the term 'specific structure' and also the correlated principle that under the same conditions different species will give different reactions.

Applying Klebs's viewpoint to the study of development, especially that of the asexual and sexual reproductive organs of fungi, the author made a detailed study of individual organisms with reference to the conditions governing the whole morphogenetic development. In these cases also the results confirmed Klebs's views. It was found that morphogenic reactions are controllable, that the definite chemical and physiological combinations

of environment are essentially precise for each of the main physiological phases of an organism's development; hence the vegetative, the asexual, and the sexual phases come to expression in the same organism under different and often contrasting sets of stimuli.

In the case of the Mucorales it was found possible to apply the principle that under approximately the same conditions each species of *Mucor* could be cultured and recognized in numerous generations even though only heterothallic forms were used. In so far as the vegetative and asexual phases of the life-histories were concerned, the specificity was sufficiently expressed in morphologically recognizable characters, so that in later years these species were easily recognized. All the species of *Mucor* tested under standard conditions developed their asexual stage uniformly. The Sphaeropsidales showed a very few exceptions. All the members of the 'ferax group' of *Saprolegnia* showed a remarkable uniformity in physiological reactions, which were found to follow closely the results obtained by Klebs with *S. mixta*. On the other hand, even when the morphological characters are but slightly differentiated between two forms of this section, their physiological specificity remains marked.

In spite of the greater physiological differences between any genera or smaller groups of Saprolegniaceae, the whole group, barring heterothallism, has a tendency towards a general reaction under an appropriate set of conditions. The physiological reactions of the species of *Phytophthora* seem to be almost as uniform as in the Mucorales; each such group, e.g., *Saprolegnia*, *Phytophthora*, and *Mucor* has its own physiological reactions, which makes it necessary to develop a standard set of conditions for each taxonomic group.

Reference is made to the work of C. W. Waters [*R.A.M.*, vii, p. 531] as showing that the formation of the uredospores and teleutospores of the rust fungi can be to some extent controlled by conditions affecting the nutrition of the host.

KLEBAHN (H.). **Research in the biology of Ascomycetes.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1725–1734, 1929.

An account is given of the author's investigations into the biology of the Ascomycetes and Fungi Imperfecti with particular reference to his attempts to secure the ascospore stages and prove the connexions. The general results of his cultural work [details of which are given] indicated that in characterizing the genera of the Ascomycetes the conidial stages must be noted; these are usually similar in nearly related Ascomycetes, though there are exceptions. Differences may exist between apparently similar fungi which can be determined only by studying the related fruit form or by behaviour in culture, this being equally true for the conidial stage in its relation to the ascigerous stage as for the latter in relation to conidia. The absence of a spore form does not exclude the possibility of a relationship to a fungus which possesses this spore form. The number of cells in a spore or a

conidium is of small importance in a study of relationships. In the classification of the Ascomycetes, and still more that of the Fungi Imperfecti, morphological methods are insufficient, cultures being indispensable.

ARTHUR (J. C.). **Botanical nomenclature.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1667–1668, 1929.

After pointing out that in the International Rules the rusts are specifically restricted as regards the starting point for nomenclature and the validity of names, the former being taken to begin for the Uredinales with Persoon's 'Synopsis Fungorum' (1801), the author states that this restriction is unnecessary, since only three genera, *Puccinia, Aecidium,* and *Uredo,* were established before 1801 and only about a dozen species were assigned to them, nearly all of which appeared in the 'Synopsis' almost unchanged. As to the second restriction, the International Rules state that among pleomorphic fungi only those generic and specific names are valid which are applied 'to the state containing the form which it has been agreed to call the perfect form', and that for the Uredinales this 'perfect state is that which ends in the teleutospore or its equivalent'. The author queries what significance attaches to the term 'equivalent' of a teleutospore and states that this rule is frequently transgressed even by prominent systematists, and consistently in the interests of good practice. Probably it reflects the erroneous notion that the situation regarding the Fungi Imperfecti among the Ascomycetes is paralleled among the Uredinales. Whatever may be expedient for the taxonomic treatment of the Ascomycetes should not be allowed to influence that of the Uredinales. In the author's opinion, there are no sufficient grounds for restricting the application of names among the rusts other than those imposed by the general rules of botanical nomenclature.

To secure uniformity and stability in the application of names and to have names acceptable to taxonomists, such matters should be brought before a permanent validating committee whose final decision should be binding.

MAINS (E. B.). **Physiologic specialization and species development and nomenclature.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926,* pp. 1767–1770, 1929.

After noting that even when classified upon a strictly morphological basis the species of the rusts differ markedly in their host range, some being confined to one host and others having many, while within these morphological species there are varieties, strains, forms, or lines which differ from each other in their adaptability to varieties, strains, or lines of the host species, the author briefly discusses the conditions which determine this adaptability. Referring to the part played by host specialization in the phylogeny of the rusts, he points out that it has had an important influence upon nomenclature. Following the realization of the obligate parasitism of these fungi, there has been a tendency to group into species rusts found upon closely related

hosts and a suggestion to consider sharply specialized forms as distinct species even when morphologically belonging to a larger group. In the author's opinion it would be less confusing to retain the specific name for groups distinguishable by their morphology and life-cycle, and indicate by other means the sub-divisions according to various reactions, such as host range.

MATSUMOTO (T.). **Antigenic properties of Tobacco mosaic juice.**— *Journ. Soc. Trop. Agric.*, Formosa, Japan, i, 3, pp. 291–300, 2 figs., 1929. [Japanese summary.]

An account is given of the writer's experiments conducted with a view to determining the antigenic properties of tobacco mosaic juice [*R.A.M.*, viii, p. 743].

Mosaic leaves were ground in a mortar and distilled water added to the mass in the proportion of 2 c.c. per 1 gm. of leaves. The mixture was filtered through cotton and centrifugalized for one hour at about 1,800 revolutions per minute. The resultant semi-transparent, supernatant liquid was passed through a Berkefeld filter and inoculated intravenously into rabbits at intervals of two days, using 0·5 c.c. for the first, and 1 c.c. for each of the following nine injections.

Serological behaviour was studied by means of precipitin reaction. The antigens used for the test consisted of: (1) ultra-filtered mosaic juice prepared as above, and (2) centrifugalized supernatant liquid of the expressed mosaic juice without ultra-filtration. To each of these solutions was added an equal part of the antiserum at varied dilution. The first reading was made immediately after the incubation period of one hour at 37° C., and the final one after the tubes had been kept in a cold room (5°) overnight. The results of the readings [which are tabulated] showed that precipitation occurred in the antiserum-virus mixtures of the two different preparations. In the supernatant semi-transparent liquid, precipitation took place at the serum dilution of 1 : 32, whereas in the transparent ultrafiltered solution the reaction was somewhat retarded. No specific precipitation was observed when either the normal serum or the normal tobacco juice was used. In a further test to determine the extent of the specific reaction of the antiserum-virus mixtures at higher dilutions, it was found that a distinct precipitation occurred at 1 : 256 and 1 : 128 where the mosaic juices were diluted in the proportions of 1 : 3 and 1 : 6, respectively, whereas at higher dilutions of the juices (1 : 12 and 1 : 24) there was a marked retardation.

Potted tobacco plants about one month old were separately inoculated under controlled conditions with the supernatant liquid and the precipitate of the antiserum-mosaic juice mixture. It was found that the infective principle of the virus had disappeared in every case from the supernatant liquids of the antiserum-virus mixtures, whence it may be inferred that the infective principle is precipitated by a specific action of the antiserum. Normal rabbit serum was found to be definitely incapable of destroying the infective quality of the virus, which was detected practically unim-

paired in the supernatant liquid of the normal serum-virus mixtures as well as in the precipitate of the same kept in contact for 48 hours.

DUGGAR (B. M.). **The nature of mosaic diseases.**—*Proc. Internat. Congress Plant Sciences, Ithaca, 1926*, pp. 1231–1242, 1929.

After briefly discussing the nature of the typical mosaic diseases of plants, with special reference to tobacco mosaic [*R.A.M.*, viii, p. 677], the author states that in a half-grown tobacco plant the distribution of the virus to all the tissues may, under the most favourable conditions, take place within five days after inoculation. The disease agency is, relatively, very resistant to changes of temperature and to such chemical agents as acids, alcohols, and the salts of the heavy metals; in respect to inactivation it is therefore in a class parallel with enzymes, certain spores, and some of the more resistant vegetative cells.

For infection to take place it appears to be probable that the virus must be placed in the injured cells or at least in contact with the plasmatic connexions between adjacent cells.

Inoculations with material from diseased tobacco leaves which had been subjected [by methods which are indicated] to grinding with diatomaceous earth gave positive results, while negative results were obtained after similar grinding of *Bacillus subtilis* and *B. prodigiosus*. The author's work on the filterability of the virus [ibid., iii, p. 357] and on the effect of dilution with the juice of various plants [ibid., v, p. 377] is briefly summarized. To study the behaviour of the virus in the presence of substances that might act as adsorbents, juice from diseased plants was diluted with water, permitted to stand for several hours, and then centrifuged at about 2,500 revolutions per minute for five minutes, finally being filtered through a spherical atometer cup. The various [named] chemical agents were allowed to act for 12 to 15 hours, after which the inoculations were made. The control diseased juice gave 90 per cent. positive results; the addition of $CaCl_2$ was in itself without effect (90 per cent. successful inoculations) but gave a precipitate which carried down the virus (80 per cent. infection). Precipitated $CaCO_3$ reduced the activity of the virus (50 per cent. successful inoculations). Charcoal rendered the mosaic agency inactive (no successful inoculations); the charcoal was first wetted and washed with alcohol, then washed three times in distilled water, in which condition it was non-injurious to *Micrococcus prodigiosus*, *Aspergillus niger*, and other organisms.

From these results obtained in filtration, grinding, and effect of certain solid agents it is concluded that the infectious agency of tobacco mosaic is an almost inconceivably small particle which cannot represent an organism with the usual characteristics. The physical and mechanical tests offered the strongest evidence for the colloidal behaviour of the agency.

The author considers that either the virus of tobacco is not a living thing, or it constitutes a kind of living thing of which no definite conception has hitherto existed, unless the bacteriophage may be regarded as analogous.

KOTTE (W.). **Der Bakterienkrebs der Tomate, eine für Deutschland neue Pflanzenkrankheit.** [The bacterial canker of Tomato, a new plant disease for Germany.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 1–2, pp. 51–56, 4 figs., 1930.

A full description is given of the external and internal symptoms of bacterial canker of tomato (*Aplanobacter michiganense*), the presence of which in Germany has recently been established [*R.A.M.*, ix, p. 276]. The causal organism [the cultural characters of which are fully described] is a non-motile rod, with rounded ends, measuring 0·8 to 1·2 by 0·3 to 0·4 μ. The first symptom of infection is the wilting and desiccation of individual leaves. The lateral shoots, and later the main one, hang down limply; strips of brown necrotic tissue, 10 to 20 cm. in length and 5 to 10 mm. wide, extend along the stalks. The development of the fruits is arrested, though they show no external sign of disease, and finally they shrivel and drop. The vascular bundles show characteristic disturbances, the smaller ones being filled with brown masses and the larger often completely broken down, thus producing cavities. The brown discoloration extends through the main and lateral shoots, petioles, and leaf veins, and penetrates to the pedicel and the fruit tissue as far as the chalaza. As a result of this disorganization the diseased stems are liable to split, the outer part peeling off in long strips.

Contrary to observations in the United States, where the disease occurs in greenhouses, the damage is restricted under German conditions to outdoor tomatoes. Inoculation experiments showed that infection occurs through the soil. The Tuckswood, Triumph, and Lucullus varieties are all susceptible.

MCWHORTER (F. P.) & PARKER (M. M.). **A comparison of wilt resistant Tomatoes in Virginia.**—*Virginia Truck Exper. Stat. Bull.* 69, pp. 789–797, 3 figs., 2 graphs, 1929.

Field experiments in 1929 in two localities of the Northern Neck region of Virginia, conducted on the same lines as those of previous years [*R.A.M.*, ix, p. 70], again showed that the Marglobe and Invincible tomato varieties are considerably superior to Stone in their resistance to wilt (*Fusarium lycopersici*). The Invincible variety also proved to be a good cropper and to be of an excellent canning type.

TCHERNETZKAYA (Mme Z. S.). Микофлора лесов С. Осетии и их фитопатологическое состояние. [Mycoflora of the forests of N. Ossetia and their phytopathological condition.]—Abstract in *Дневник Всесоюзн. Съезда Ботаников в Ленинграде в январе 1928 года.* [*Proc. Pan-Soviet Congress of Botanists in Leningrad in January, 1928*], pp. 188–189, 1928. [Received April, 1930.]

A phytopathological investigation made in 1925 and 1926 of the forests of North Ossetia [Black Sea littoral of the Caucasus] showed that they may be divided broadly into three zones. The first extends from sea-level to an altitude of 800 m., and is an association of broad-leaved species with a predominance of hornbeam

(*Carpinus* spp.), an abundant grass cover, and thick undergrowth. In this zone over 400 species of fungi were recorded during the investigation, of which the following are considered to be the most dangerous forest parasites encountered: *Polyporus* [*Fomes*] *fomentarius* and *P.* [*F.*] *igniarius* (15 per cent. of all species of trees infected), and *Oidium dubium* Jacz. on oak (incidence up to 15 per cent.).

(2) The second zone extends from 400 to 1,800 m. and consists chiefly of beech (mainly *Fagus orientalis*) with a small admixture of other broad-leaved species; this zone yielded over 500 species of fungi, and 15 to 25 per cent. of the beeches were infected with one or more of the following fungi: *F. fomentarius*, *F. igniarius*, *Daedalea* [*Trametes*] *gibbosa*, *Armillaria mellea*, and *Pholiota squarrosa*.

(3) The third zone, from 1,800 to 2,400 m., consists of two different types of association, one with a predominance of birch, and the other of pines (chiefly *Pinus sylvestris* and *P. montana*). In the latter 200 species of fungi were recorded, among which the following are considered to be the most important: *Hendersonia acicola* and *Lophodermium pinastri* on the needles (up to 40 per cent. infection), and *Polyporus pinicola*, *Stereum pini*, and *Trametes pini* on the boles (about 10 per cent. infection).

Wollenweber [H. W.]. **Germany: present state of Elm disease.**—*Internat. Bull. of Plant Protect.*, iv, 1, pp. 1–2, 1930.

Attention is drawn to the recurrence, in epidemic form, of the elm disease caused by *Graphium ulmi* [*R.A.M.*, ix, p. 4] in Germany during the last two years. Cases of resistance to the fungus have been observed among individuals of normally susceptible varieties, e.g., *Ulmus campestris* and *U. americana*, and it is expected that the cultivation of such individuals to the exclusion of the more susceptible members of the species will gradually lead to a high degree of immunity. *U. vegeta*, *U. scabra* var. *dampieri*, and other fastigiate varieties appear to be almost or quite resistant to *G. ulmi*, while there are considerable chances of finding resistant seedlings in the mountains. A homogeneous elm stock could be established by the vegetative propagation of resistant individuals. The fact that *Zelkowa keaki* was found to be highly susceptible to *G. ulmi* in 1929 appears to contradict the original idea that this fungus is specific to the elm.

Metcalf (H.). **The Dutch Elm disease.**—*Proc. Ann. Meeting Fifth Nat. Shade Tree Conf., 1929*, pp. 60–61, 1929.

After a brief account in popular terms of the symptoms and distribution of Dutch elm disease (*Graphium ulmi*) [see preceding abstract], the author states that the external symptoms may be confused with those of the native disease of elms prevalent especially in the vicinity of the Great Lakes and caused by *Sphaeropsis ulmicola* [*R.A.M.*, vi, p. 215]. The latter is, however, characterized by definite cankers on the trunk and limbs and does not present the dark spots, rings, and streaks in the wood which indicate infection by *G. ulmi*.

HARRISON (K. A.). **Willow blight.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 34–36, 1 pl., 1929. [Received May, 1930.]

An epidemic of willow blight, associated with a species of *Gloeosporium*, has been spreading in eastern Canada since 1927. Inoculation experiments with the fungus produced the typical symptoms of infection in 40 to 48 hours on susceptible varieties. Three spore forms have appeared during the investigation on this disease, viz., the *Gloeosporium* stage occurring in nature, artificial inoculations and occasionally, in cultures on sterilized willow twigs; an *Ovulariopsis* type, common in cultures on sterilized potato and bean plugs, but not observed in nature; and a perithecial stage of the *Glomerella* type found abundantly in nature and on willow twig cultures. The disease is believed to be identical with black canker of willow (*Physalospora miyabeana*) [*R.A.M.*, ix, p. 7]. The fungus overwinters in the twig lesions.

CLINTON (G. P.). **Willow scab-blight.**—*Proc. Ann. Meeting Fifth Nat. Shade Tree Conf., 1929*, pp. 61–62, 1929.

The author traces the various reports of willow scab (*Fusicladium saliciperdum*) [*R.A.M.*, viii, p. 614] in the eastern regions of Canada and the United States since it was first detected in the latter country in 1927. The progress of the disease on the host is briefly described and the relative susceptibility of some of the chief species of *Salix* is indicated [loc. cit.]. Inoculation experiments with a pure culture of *F. saliciperdum* on several varieties of basket willows in a region where the disease does not occur gave positive results. This result does not confirm the conclusion reached by Nattrass in England [ibid., viii, p. 275] that the injury is not due to this fungus.

MCCALLUM (A. W.). **Forest pathology.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 36–39, 2 pl., 1929. [Received May, 1930.]

This is an expanded account of the writer's researches on the occurrence of Woodgate rust [*Peridermium* sp.] of Scotch pines [*Pinus sylvestris*] in eastern Canada, a preliminary notice of which has already appeared [*R.A.M.*, viii, p. 683].

GÜSSOW (H. T.). **Needle blight of White Pine.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 31–33, 1929. [Received May, 1930.]

Following the abnormally wet summer of 1928, white pines (*Pinus strobus*) in Ontario suffered severely from a physiological derangement known as needle blight [*R.A.M.*, iii, p. 113]. The condition is manifested by a bright rusty-red discoloration of the current season's needles which is liable to confusion with the symptoms due to blister rust [*Cronartium ribicola*]. The cause of the disturbance is believed to be the destruction of the fine root-hairs, involving the temporary suspension of the assimilatory functions.

Metcalf (H.). **The European Larch canker.**—*Proc. Ann. Meeting Fifth Nat. Shade Tree Conf., 1929*, pp. 58–59, 1929.

European larch canker (*Dasyscypha willkomii*) [*D. calycina*], recently introduced into the United States [*R.A.M.*, viii, p. 744], is thought to be probably a source of great danger since it threatens the native tamarack [*Larix laricina*], the valuable native western larch [*L. occidentalis*], and all the introduced and cultivated larches. In addition, this disease, or a closely related one associated with a fungus of the same genus, has attacked Douglas fir [*Pseudotsuga taxifolia*: ibid., ix, p. 280] and western yellow pine [*Pinus ponderosa*], which two species of trees represent an enormous financial value and together constitute more than one-half of the remaining standing merchantable timber in the United States. The disease has become established in New England, being at present restricted to eastern Massachusetts and Rhode Island, whereas the trees requiring protection are mainly in the Rocky Mountains and western regions.

Jacobs (H. L.). **The practice of tree injection.**—*Proc. Ann. Meeting Fifth Nat. Shade Tree Conf., 1929*, pp. 39–42, 1929.

After expressing the opinion that the treatment of trees by injections offers the most promising field of tree disease control as yet unexplored, the author states that he has confined his researches to some typical tree diseases which have not been successfully treated by other means, including chestnut blight (*Endothia* [*parasitica*]) and iron deficiency chlorosis [*R.A.M.*, viii, p. 473].

As previous investigators had found that the holes through which the solutions are injected become clogged, the author attempted to devise apparatus and methods to render possible rapid and efficient injections into large trees and found that he was able to get a large white birch to take up about four gallons of solution in fifteen minutes. The work done with oaks and birches indicated that the rate of intake is in direct proportion to the pressure applied.

Numerous powerful germicides and fungicides were injected into chestnut trees. The cambium and outer layer of sapwood of a number of trees were saturated with aniline dyes, germicidal at a dilution of 1 in 1,000,000; yet healthy sporulating cankers developed directly in the stained tissues.

Gratifying results, however, were obtained in the treatment of iron deficiency chlorosis, definite improvement in the colour of the foliage being obtained in 95 per cent. of the treated trees. Some trees, the leaves of which were almost devoid of chlorophyll and on which twig growth had almost ceased, developed a few weeks after treatment a bright green new terminal growth and the leaves already formed changed from lemon-yellow to healthy green; a year and a half later these trees showed no sign of relapse.

In the treated chestnut trees gentian violet was taken up in moderate quantities and was well distributed throughout the cambium and outer layer of xylem tissues. In apple trees the same solution was absorbed in greater quantities but was not distributed laterally beyond the width of the injection holes. In both apple

and chestnut, acid fuchsin spread well in the cambium, sapwood, and leaves throughout the entire tree. When injected into white birch, the dye reached the leaves, but travelled only in the pith and medullary ray regions.

FLACHS (K.). **Wichtige Krankheiten und Schädlinge an Gemüse.** [Important vegetable diseases and pests.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, vii, 10–11, pp. 250–264, 1930.

Popular notes are given on some of the common diseases of cabbage, cucumbers, tomatoes, spinach, lettuce, and celery in Germany, with directions for their control.

RACICOT (H. N.). **Report of the Dominion Field Laboratory of Plant Pathology, Ste. Anne de la Pocatière, P.Q.**—*Rept. Dominion Botanist for the year 1928, Div. of Botany, Canada Dept. of Agric.*, pp. 199–202, 1929. [Received May, 1930.]

In an experiment on the seed transmission of bean [*Phaseolus vulgaris*] mosaic [*R.A.M.*, ix, p. 355], two rows of plants grown from healthy seed showed no symptoms of infection. Rows 3 and 5, with adjacent rows of mosaic on both sides, showed 1 and 6 per cent. infection, respectively, while rows 4 and 6, from diseased seed, contained 55 and 47 per cent. mosaic, respectively. The seeds from rows 1 and 2 produced all healthy plants, those from row 3 yielded plants of which 1 per cent. showed mosaic, while those of row 5 produced plants of which 3 per cent. were diseased. Some seeds from apparently healthy plants transmitted mosaic, which was also evidently conveyed from diseased to sound plants in the field.

MEYER-BAHLBURG [W.]. **Das Verhalten von Z.- und E.- Rüben gegenüber der Herz- und Trockenfäule.** [The reaction of Z. and E. Beets to heart and dry rot.]—*Illus. Landw. Zeit.*, l, 6, pp. 88–89, 2 figs., 1930.

In 1928 heart and dry rot of sugar beets [*R.A.M.*, viii, p. 217], which had been in abeyance for some years, was again very prevalent in North Germany. Attempts to ameliorate the condition by the application of various fertilizers gave negative results, but the cultivation of the resistant E variety in place of the highly susceptible Z (Klein-Wanzleben) appears to hold out considerable promise of control. In a field test on light sandy soil, the root yield of the former variety was nearly 40 per cent. higher than that of the latter, while the incidence of severe infection was only 5 as compared with 73 per cent.

KOTTE (W.). **Eine bakterielle Blattfäule der Winter-Endivie (Cichorium endivia L.).** [A bacterial leaf rot of the winter Endive (*Cichorium endivia* L.).]—*Phytopath. Zeitschr.*, i, 6, pp. 605–613, 5 figs., 1930.

Winter endives (*Cichorium endivia*) in market-gardens and allotments in Baden (Germany) were observed, in August, 1929, to be suffering from a bacterial rot characterized by the development on the older leaves of irregularly distributed spots, dark brown to

black under moist conditions and coffee-coloured when dry. The necrotic discoloration rapidly spreads along the veins, while the area between the latter is more gradually affected. When a spot penetrates to the midrib, necrosis of a wedge-shaped area of the lamina above the point of infection often results. There is always a sharp line of demarcation bounding the necrotic leaf tissue, the yellow zone tissue surrounding the spots in some other bacterial leaf rots being entirely absent in this case. Under dry conditions the disease may be arrested at this stage; in damp weather, however, the decay progresses until the entire leaf blade, including the midrib and petiole, loses its turgescence and ultimately the leaves collapse and rot on the ground. The youngest leaves remain healthy until finally they also begin to rot from the base upwards, possibly as a result of secondary infection by facultative parasites.

The intercellular spaces of the mesophyll are filled with liquid containing immense numbers of bacteria and the cells are darkened. The turgor of the affected cells is completely destroyed and the chloroplasts are swollen, coagulated, olive-green, and stain abnormally vividly with haematoxylin. The cell sap contains very delicate brown concretions. The xylem parenchyma of the vascular bundles shows a brown discoloration and the phloem is olive-green. The contents of the latex-tubes of the phloem are a deep brown.

The causal organism of the endive rot is a rod-shaped bacterium measuring 1 to 2·4 μ (average 1·5 μ) by 0·2 to 0.3 μ, actively motile by 1 to 5 terminal flagella, 2 to 5 μ long; Gram-negative, non-acid-fast, forming whitish-grey, transparent, moist, glistening colonies on bouillon agar, turning litmus milk permanently blue in a few days, forming a small quantity of indol but no gas; resistant to desiccation; thermal death point near 48° C. The organism is named *Pseudomonas endiviae* n. sp.

Inoculation experiments with suspensions of the bacterium on mature endive plants at 18° to 22° gave positive results, the highest percentage of infection occurring through needle pricks at an atmospheric humidity of 97 to 99 per cent. Infection also resulted from placing drops of a bacterial suspension on the unwounded leaf surface, but in such cases entry was effected through the lesions caused by the uredo sori of *Puccinia cichorii* [*R.A.M.*, v, p. 275]. *P. endiviae* is apparently unable to penetrate the uninjured leaf epidermis. The endive rot organism was found to be slightly pathogenic to lettuce. No experiments in control could be conducted, as the season was too far advanced, but some general directions are given for the treatment of diseased plants and for soil disinfection.

RAVAZ (L.). **Radicelles de Vigne court-nouée.** [Rootlets of Vines suffering from 'court-noué'.]—*Prog. Agric. et Vitic.*, xciii, 1, pp. 3–4, 1 col. pl., 1930.

This brief note is in the nature of an explanation of the accompanying coloured plate, which shows rootlets from French and American vines suffering from court-noué [*R.A.M.*, ix, p. 360] in various stages of development. The main feature common to

all is the presence on the rootlets of more or less numerous swellings bearing on their surface just emerging embryonic rootlets which appear to be incapable of further elongation. The root system of the affected vines remains in this condition until the autumn, but most of it rots during the winter, so that in the spring but few healthy rootlets remain.

Rives (L.). **Nouvelles recherches sur le mal-nero.** [New studies on 'mal nero'.]—*Prog. Agric et Vitic.*, xcii, 43, pp. 395–399; 44, pp. 424–426; 45, pp. 448–453, 1929.

A brief description is given of a serious bacterial disease which the author observed in two vineyards of the department of Var [south of France] attacking the American hybrid 3309 grafted with French vines, and which he considers to be identical with Baccarini's 'mal nero' attributed to *Bacillus vitivorus* [*R.A.M.*, i, p. 154]. The symptoms consisted of a shortening of the internodes and malformations of the leaves of new shoots, strongly reminiscent of court-noué [see preceding abstract] except that the internodes did not grow in zigzag fashion and their cortical and phloem tissues did not show the brown lesions characteristic of court-noué. The wood of the stocks had well defined lesions advancing from the graft joint downwards, and the wood cells were filled with a brown matter believed to be the result of their breakdown. Isolations from the advancing margin of the lesions consistently yielded a coccus less than 1 μ in diameter, morphologically similar to *B. vitivorus*, but differing from it in some cultural details. The pathogenicity of the organism is being tested, but the results are not yet available.

The similarity of certain of the symptoms of these cases of mal nero with those of court-noué suggested the possibility that the above-mentioned organism may be one of the contributory causes of the parasitic form of the latter [ibid., viii, p. 421]. The author accordingly examined in detail cases of court-noué in a number of vineyards in the department of Aude. In several of these [details of which are given] he found a coccus morphologically identical with *B. vitivorus* in all the aerial and underground organs of the vines, associated with browning and necrosis of the cells. He believes that normally the coccus is a soil saprophyte, but that it becomes capable of attacking vines weakened by unfavourable soil or other conditions, in the same way that court-noué may be caused by mycorrhizal fungi which become parasitic under conditions unfavourable to the host [ibid., vi, p. 334].

The paper terminates with a brief discussion of control measures against mal nero and court-noué in the light of these observations.

Serbinoff (V. I.). Наблюдения над болезнью Виноградной лозы „церкоспора". [Observations on the '*Cercospora*' disease of the Vine.]—*За реконструкции Сельского Хозяйства* [*Agricultural Reconstruction*], *1929*, Samarkand, 8, pp. 87–98, 1929.

This is a brief preliminary report of the investigation of the '*Cercospora*' disease of the vine in Russian Central Asia [*R.A.M.*, vii, p. 617; viii, p. 11], which is steadily increasing in severity. The two species mainly involved are *C. roesleri* and *C. vitiphylla* [a

brief historical account of both of which is given], while *C. vitis* occurs rarely and is not dealt with.

Observations and experiments indicate that both *C. roesleri* and *C. vitiphylla* are facultative parasites which attack vines debilitated by some other cause, such as mechanical or insect injury, poor cultivation, excess of shade and air moisture, and the like. The main damage is done to the foliage, which dries up and falls off long before that of healthy plants, while the grapes are never attacked, and mycelium of *C. roesleri* was found in the cortical tissues of shoots in one case only.

Cultural studies of the organisms [details of which are given] confirmed their separation as distinct species, although they have many features in common. Thus, the germination of the conidia of both occurred by budding on all the media tested, and a large number of involution forms (small, rounded or ellipsoidal conidia) were produced. The optimum temperature for germination was 30° to 32° C., but the maximum and minimum temperatures were not determined. Further experiments proved that the conidia may overwinter on dry vine leaves exposed under natural conditions to winter temperatures as low as −20° C.

In a small range of tests the disease was best controlled by lime-sulphur and Bordeaux sprays (normal concentrations), neither of which injured the foliage; the polysulphide plus sulphate of zinc recommended by Zaprometoff [loc. cit.] was somewhat less effective. The preventive measures should consist in the removal before winter of all fallen vine leaves and their destruction by fire, good tillage, and the avoidance of all causes which may weaken the vines. In Russian Central Asia all European varieties of the vine have so far proved immune from the disease. There was some evidence of variations in the relative susceptibility of the local varieties, but further work is needed in this respect.

Uppal (B. N.). **Appendix M. Summary of the work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1928–29.**—*Ann. Rept. Dept. of Agric. Bombay Presidency for the year 1928–29*, pp. 199–204, 1930.

Extensive trials indicated that no deterioration in fungicidal value against the vine *Oidium* [*Uncinula necator*] resulted when sulphur was mixed with lime, gypsum, or cement in amounts not exceeding 20 per cent. of its weight.

In further tests on the control of sorghum smut [*Sphacelotheca sorghi*: *R.A.M.*, viii, p. 233] very effective control was secured by dusting at the rate of 4 to 5 oz. of sulphur to 60 lb. of seed, the cost being equivalent to less than one pie [less than one-twelfth of a penny] per acre. The dusted seed can also be safely fed to cattle.

Fig rust (*Uredo* [*Kuehneola*] *fici*) caused defoliation and reduction in yield. Sulphur dusting gave good control with very slight injury to the leaves; lime-sulphur wash was ineffective and injurious, but sulphur lime dust was fairly effective.

With reference to the previous report that young bajri plants [*Pennisetum typhoideum*] had been artificially infected with the

oospores of *Sclerospora graminicola* [ibid., vii, p. 780] but that all attempts to secure artificial infection of sorghum plants with the oospores of *S. graminicola* var. *andropogonis sorghi* had failed, it is now stated that infection of sorghum with the latter fungus has been secured under controlled conditions. In a saturated atmosphere sporulation occurred at 25° C.; the conidia did not germinate at 11° to 12°, but did so profusely at 15°. *P. typhoideum* was infected by oospores of the fungus taken from sorghum, but when the latter was exposed to infection by oospores taken from *P. typhoideum* only one infection resulted. Both, however, were readily infected by oospores taken from *Setaria viridis* in America.

Sweet varieties of citrus were completely susceptible to gummosis, but the sour varieties such as the santra [loose-skinned] orange [*Citrus aurantium*: ibid., viii, p. 442], lime, and some of the wild varieties such as jamburi [*C. medica* var. *limonum*] were extremely resistant. With budded sweet varieties the stock was resistant and infection took place at or above the bud joint. When the trees were artificially infected, gum exudation usually began after 10 days and became very marked after 20 days.

Mosaic disease of chillies [ibid., ix, p. 10] developed on healthy plants grown in insect-proof cages when 2 to 10 thrips were placed on each plant, the virus being also transmitted from diseased to healthy plants by means of the juice. It was proved that thrips are not the cause but only the vectors of the disease. Mites failed to transmit the virus.

The wilt of betel vines [*Piper betle*] caused by *Sclerotium rolfsii* [ibid., viii, p. 264] became so serious during 1928 that a comprehensive investigation of the disease has been undertaken.

WALLACE (G. B.). **Mycological work.**—*Ann. Rept. Dept. Agric. Tanganyika Territory 1928/29*, Part ii, pp. 35–36, [1930].

During the period under review four new diseases of cotton were reported from Tanganyika Territory [cf. *R.A.M.*, viii, p. 485], viz., violet root disease (*Rhizoctonia crocorum*) [*Helicobasidium purpureum*], a leaf spot due to *Ascochyta*, a *Diplodina*, and *Gibberella moniliformis*, which was found once in the conidial stage in open bolls. The only important diseases were those caused by *Bacterium malvacearum*, *Nematospora gossypii*, and *Mycosphaerella gossypina*, which were present in the Tabora and Mwanza areas.

Sisal [*Agave rigida sisalana*] was affected only by physiological diseases, sometimes associated with secondary attacks of fungi. Sun scorch [cf. ibid., viii, p. 632] was the most prevalent and destructive. A condition referred to as 'waterlogging disease' was observed on two plantations; blue-black areas appeared at the base of the leaves and gradually spread. If normal soil conditions did not become re-established the whole base rotted, emitting an offensive odour.

Rhizoctonia bataticola [*Macrophomina phaseoli*] was found on the roots of coffee suffering from root disease.

Other new records included *G. moniliformis* (conidial stage), a *Fusarium*, *Rhinotrichum cucumerinum* (only once recorded previously, on maize), *Phoma insidiosa*, a *Choanephora*, and *Acrothe-*

cium lunatum, all on sorghum, *Ovulariopsis moricola* [*Phyllactinia corylea*] causing leaf spot of *Morus alba*, *Cercospora cajani* and *Oidiopsis taurica* on *Cajanus indicus*, *Thielaviopsis* [*Ceratostomella*] *paradoxa* on pineapple, *Erysiphe polygoni* on *Phaseolus radiatus*, *Cercospora longipes* causing leaf spot of sugar-cane, and *Pestalozzia versicolor* (probably saprophytic) on *Lushingtonia filifera* and rose.

Elsewhere in the Report [on p. 31] it is stated that the bacterial blight of mulberry due to *Bacterium mori* occurs on old plantings and newly planted out French stock.

[Shepherd (E. F. S.).] **Botanical Division.**—*Ann. Rept. Mauritius Dept. of Agric. for the year 1928*, pp. 10–13, 1930.

During the period under review leaf scald of sugar-cane (*Bacterium*) [*albilineans*: *R.A.M.*, ix, p. 340] was first recorded in Mauritius, where it has long been present but confused with gummosis (*Bact. vascularum*); it is now widely prevalent, especially on the White and Striped Tanna varieties, and may cause a loss of 5 to 11 per cent. of the weight of the cane, the sucrose content of which may be reduced 16 per cent. below the normal. Owing, however, to the tolerance shown by White Tanna, good yields are obtainable from this variety when conditions are favourable. White Tanna is also commonly affected by *Bact. vascularum*, but the losses caused are less than those due to scald. R.P. 8 (an increasingly popular Demerara seedling) is very resistant to both diseases.

The results are tabulated (pp. 30 to 39) of a systematic survey of the extent of spread of *Bact. albilineans*, *Bact. vascularum*, and red rot (*Colletotrichum falcatum*) on White Tanna, D.K. 74, M. 55, and M. 131. The most susceptible sugar-cane to red rot is D.K. 74, but in one locality R.P. 6 was also seriously affected; White Tanna is resistant. The amount of red rot present in Mauritius as a whole was less than in 1927, but in certain coastal areas the losses on D.K. 74 were at least as heavy as in that year.

The 'smut' disease of 'filao' (*Casuarina equisetifolia*) [ibid., viii, p. 466] did not spread from the previously affected area in experimental plots to trees separated from it by trenches, but showed signs of spreading to an adjoining area not so separated.

A few cases of bitten leaf of coco-nut (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., vii, p. 629] were reported, occasionally followed by a bud rot. A rather severe outbreak of bud rot was also observed on royal palms (*Roystonea regia*) in one locality, the symptoms suggesting the direct attack of a parasite on the heart of the trees through the outer overlapping leaf sheaths. Various organisms, including *C. paradoxa*, were isolated from freshly diseased tissues.

Other diseases recorded included root disease of *Terminalia arduna*, caused by *Armillaria mellea* and resulting in the death of the trees; mosaic on Cucurbitaceae, tomato, and *Capsicum annuum*; ergot (*Claviceps paspali*) on *Paspalum dilatatum*; *Pseudomonas campestris* on cabbage and cauliflower; *Ascochyta pisi* on peas; and a blight of carrots associated with a *Cercospora*.

Slate (W. L.). **Report of the Director for the year ending October 31, 1928.**—*Fifty-second Rept. Connecticut Agric. Exper. Stat. for the year 1928* (*Bull.* 298) pp. 115–139, 11 figs., 1929. [Received April, 1930.]

During the period under review the work of white pine blister rust [*Cronartium ribicola*] eradication was conducted in 26 towns of Connecticut, 123,385 wild and 1,151 cultivated *Ribes* being destroyed over an area of 75,102 acres [cf. *R.A.M.*, viii, p. 225].

The inoculation of tobacco plants with the 'white pickle' mosaic of cucumber [ibid., ix, p. 427] produced some leaf mottling, but no plate crystals. As in the case of previous experiments with white pickle on Cucurbitaceae, the symptoms were merely temporary, disappearing with the formation of new growth.

Considerably over half of the 2,500 chestnut seedlings planted out in four localities of the State to determine their resistance to blight [*Endothia parasitica*: ibid., ix, p. 216] have died from unfavourable environmental conditions, but not from the effects of the disease. Further work on similar lines is in progress.

Forty-eighth Annual Report of the Ohio Experiment Station for 1928–29.—*Ohio Agric. Exper. Stat. Bull.* 446, 216 pp., 18 figs., 1 diag., 9 graphs, 3 maps, 1930.

The following are some of the references of phytopathological interest occurring in this report (pp. 59–77). Immense losses were caused in southern Ohio during 1928 by Brooks's spot of apple [*Phoma pomi*: *R.A.M.*, viii, p. 727], which was found to overwinter on old leaves of various kinds and to discharge its spores in the spring in much the same way as in *Venturia inaequalis*. The disease was adequately controlled in a test on Rome Beauty apples at Jackson by three applications of 2–4–50 Bordeaux mixture (11th May, 3rd June, and 13th July), the incidence of infection being reduced from 100 to 1·4 per cent. Practically perfect control (0·1 per cent. infection) was given by four applications of the same preparation at a strength of 3–4–50, the additional spray on 22nd May being apparently the most effective.

Cherry leaf spot [*Coccomyces hiemalis*] was well controlled by six applications (between 8th May and 17th July) of 1–50 liquid lime-sulphur [ibid., ix, p. 113].

A considerable reduction in the incidence of aster [*Callistephus chinensis*] yellows (from 60 to 16·9 per cent.) was effected by the cultivation of the plants under 18-mesh wire screens 5 ft. high, thereby excluding the insect vector of the virus *Cicadula sexnotata* [ibid., ix, pp. 261, 289]. It has become almost impossible to grow good asters out of doors in Ohio on account of this disease.

Rust of carnations [*Uromyces caryophyllinus*: ibid., vii, pp. 11, 61] was found to be particularly severe on the Betty Low, Early Dawn, Harvester, and Enchantress Supreme varieties, while Pink Abundance, Ivory, Donald, White Matchless, Fairy Queen, Eldora, Pink Eldora, and Golden Glow are resistant.

Heavy losses occur among dahlias as a result of the so-called 'stunt' disease [ibid., vii, p. 307], in which at least two distinct troubles have been included. In one of these the plants cease to grow

in consequence of the feeding of leafhoppers on the leaves in hot, dry weather, while in the other the plants are stunted from the beginning and often form an excessive number of shoots. The leaves of these latter plants are often curled and very susceptible to hopperburn; numerous small cracks appear in the stem and also in the skin of the tubers, the development of which is much retarded. Plants affected by this type of stunt seldom flower, whereas those merely suffering from leafhopper injury may recover with the advent of cooler conditions. Experiments have shown that the stunt disease, which is considered to be probably a virus transmissible by insects, is capable of spreading and that it persists in the tubers from one year to the next.

Gladiolus scab [*Bacterium marginatum*: ibid., ix, p. 457] was well controlled by two hours' immersion of the corms in mercuric chloride (1 in 1,000) or seven hours in 1 per cent. semesan, the incidence of infection being reduced from 15·5 to 1·9 and 0·9 per cent., respectively.

Juniper blight (*Phomopsis juniperovora*) [ibid., vi, p. 327] is stated to have become so serious in Ohio in recent years that the cultivation of seedling trees for grafting has been practically abandoned. The first symptom of the disease is the straw colour of the new growth: infection then extends rapidly down the young twigs to the stem, which is girdled and the whole plant killed. By the end of the second summer 70 to 80 per cent. of the seedlings may be destroyed. The fungus fruits freely on the diseased leaves.

Heavy damage was caused to white pine [*Pinus strobus*] and Norway spruce [*Picea excelsa*] seedlings in a State forest nursery by *Thelephora laciniata* [ibid., vii, p. 349]. The stems were smothered by a compact mass of mycelium, light brown at first with a cream-coloured margin, but becoming darker as it extended over the needles. The lower needles were covered with the irregular, nearly black fructifications.

Recent experiments confirmed previous suspicions as to the dissemination of bacterial canker of tomato [*Aplanobacter michiganense*] by the seed [ibid., ix, p. 419]. It was further proved that the bacteria may be carried on the hands in passing from diseased to healthy plants in suckering. The causal organism appears to persist in the soil for an indefinite period.

A yellow to orange, viscous bacterium has been isolated from sweet clover [*Melilotus alba*] plants showing leaf spots and cankers on the stems and roots, and inoculated into healthy individuals with positive results.

The serious disease of ginseng [*Panax quinquefolium*] caused by *Alternaria panax* Whetzel [ibid., viii, p. 391] may be controlled by four applications of 3–3–50 Bordeaux mixture plus 1 lb. fish-oil soap per 50 galls. of spray.

Onion smut [*Urocystis cepulae*: ibid., v, p. 556] may be controlled by liquid or dry treatment with formalin, the former (1 in 128) being more effective in years with low soil moisture at planting time and the latter (90 lb. per acre) when the soil is very wet, as in 1929. A carrier such as kaolin or infusorial earth should be used with the dust.

New science for an old art.—*Forty-sixth Ann. Rept. Wisconsin Agric. Exper. Stat. 1928–1929* (*Bull.* 410), 55 figs., 3 diags., 1 graph, 1930.

Among the items of phytopathological interest in this report (in addition to those already noticed from other sources), the following may be mentioned. Barley scab (*Gibberella saubinetii*) [*R.A.M.*, ix, pp. 368, 369] may be largely controlled by the thorough ploughing under of the stubble. Thus, in 1928 scab was present on 17 per cent. of the grain in 58 poorly ploughed fields, while only 2 per cent. infection occurred in 102 well cultivated ones.

Dry lime-sulphur (4 in 50) may be substituted for the liquid in the final (summer) treatment of apple scab [*Venturia inaequalis*], but wettex [ibid., ix, p. 432] was usually somewhat less effective than either of these preparations. Under Wisconsin conditions, the pre-blossom period is very critical for scab control, and as many as four treatments may be necessary in cold, wet springs from the delayed dormant stage until the blossoms open. Under controlled greenhouse conditions, lime-sulphur (1 in 40) plus lead arsenate (1 in 50) was very effective against scab when applied 35 hours after the beginning of an infection period at 59° F. and 100 per cent. relative humidity. When the experimental plants were subjected to brief increases of temperature up to 79° to 86° F. during the early part of the incubation period, the interval after inoculation at which the sprays could be effectively applied was extended. Sulphur dusts and wettable sulphur preparations were much less effective than lime-sulphur in checking the disease after the occurrence of infection. The addition of an alkaline or neutral soap (4–50) greatly enhanced the efficacy of wettable sulphur.

The wilt (*Fusarium conglutinans* var. *callistephi*)-resistant strains of aster in the Late Giant Branching, Heart of France, and American Beauty varieties continue to prove satisfactory [ibid., viii, p. 553]. A number of these strains grown on badly infested soil in California maintained their resistant character.

Over 75 per cent. of the cabbage seed used in the commercial truck regions of the Middle West is stated to be of varieties resistant to wilt [*F. conglutinans*] originating at the Station. Resistance to yellows has been found to be a purely genetic character [ibid., viii, p. 552] which is maintained even under adverse environmental conditions, e. g., the raising of the soil temperature to 77° F. *F. conglutinans* has been found to invade the plants at the extreme growing ends of the roots, where it penetrates between and sometimes through the cells until it reaches the young water vessels and follows them up the root and throughout the stem and leaves. The yellowing and dying of the plant are probably due chiefly to the toxic effects of the by-products of the fungus in the vessels.

Ciferri (R.). **Phytopathological survey of Santo Domingo, 1925–1929.**—*Journ. Dept. Agric. Porto Rico*, xiv, 1, pp. 5–44, 2 pl., 2 maps, 1930.

In this paper notes are given on the most important diseases of economic plants recorded from 1925 to 1929 in the Dominican

Republic, most of which have already been mentioned in the lists of Dominican fungi published by the author and González Fragoso [*R.A.M.*, viii, p. 812].

A scientifically interesting but economically unimportant disease of cacao trees, tentatively named 'roncet' because of its external similarity to 'roncet' or 'court noué' of the vine [see above, p. 503], is found in neglected plantations in Santiago. At an advanced stage the most apparent symptom is a reduction in the number of leaves, which are generally clustered at the tips of the branches and gradually shrivel in the intraveinal spaces. These leaves usually show corrugations which are convex on the upper and concave on the under side. Frequently the leaves twist and bend, and their edges are irregularly toothed; later an uneven discoloration may develop in the intraveinal spaces. The young shoots on affected trees grow very little and have very small leaves which never reach normal size, though comparatively long and thin twigs may be formed, resembling witches' brooms and bearing a few small leaves. Although the diseased trees may still produce flowers, the latter do not set fruit or, if they do, the young pod becomes mummified. The spread of the disease is very slow and irregular; local growers consider it to be contagious, but inoculation experiments by grafting or by direct inoculation of the juices of diseased leaves into healthy plants have so far given negative results. The author considers the trouble probably to be of a degenerative type.

Bud rot of coco-nuts (*Phytophthora palmivora*) [ibid. ix, p. 304] is stated to occur very rarely in Santo Domingo, with a tendency to be localized and to spread very slowly, in strong contrast to its behaviour in the neighbouring island of Cuba and in Porto Rico.

Of the fungal diseases of coffee (*Coffea arabica*) the most serious are root rots, the most harmful and widespread of which appears to be the black root rot caused by species of *Rosellinia*; in the few cases in which the fungus was identified, it was found to be *R. pepo* [ibid., viii, p. 20]. The white root disease [ibid., viii, p. 442], caused by two unidentified species of *Rhizoctonia*, is less frequent and occurs chiefly in Barahona. Inoculation experiments indicated that a predisposing factor to the disease is a neutral or slightly alkaline soil which is unfavourable or harmful to the vigorous growth of coffee and renders the latter very susceptible to various root diseases. Indirect evidence indicates that the causal organism of white root rot may be the normal *Rhizoctonia* endophyte of coffee roots which, under unfavourable conditions for the host, may become parasitic; this view is supported by the fact that the fluid from liquid cultures of the mycorrhizal fungus exhibited *in vitro* a decided pathogenic action on sections of young and healthy coffee rootlets.

An account is given of a disease of immature maize ears which is tentatively termed 'spike top rot' and which is caused by one or two species of bacteria. It is usually associated with attacks on the young ears of the larvae of a dipterous insect (*Heliothis obsoleta*), and is characterized by a soft, yellow or dark rot extending from the tip of the ear downwards and occasionally

involving the whole green ear. The affected part does not produce grain, but the portion not affected ripens normally. The disease chiefly develops in rainy seasons, and early infections are more destructive than late ones. The estimated average damage done in experimental plots was about 5 per cent. The pathogenicity of the organisms isolated from the lesions was demonstrated in inoculation experiments.

Papaw trees in Cibao are widely affected with a curly leaf disease resembling that described from Jamaica [ibid., viii, p. 631] and generally found on old trees, but occasionally also on young plants. The first symptoms are a curling of the younger leaves which gradually twist to form 'cushions', and a partial yellowish discoloration of the old leaves, forming a mosaic pattern of yellow and green spots. When the trees lose their leaves, which occurs in one or two months, new growths are developed either apically or laterally, but sooner or later these also become diseased and die off, when they are again replaced by similar new growths, this condition prevailing for a number of months or even for a year or two, until the tree finally dies. In some cases the trunks of affected trees bear a series of suberous outgrowths consisting of stratified layers of sub-epidermal cork. Isolations from the latex of diseased trees failed to show the presence of any organism, with the exception of bacterial zoogloeae which were found in one case, but a series of inoculation experiments with the latex from diseased trees gave a moderate percentage of infections.

In Villa Vázquez and Santiago a destructive disease occurred in 1928 on sesame (*Sesamum orientale*), the symptoms of which were very similar to those of tobacco black shank [*Phytophthora nicotianae*: ibid., viii, p. 470]. It is attributed to an undetermined species of *Phytophthora* which rapidly developed in a moist chamber on infected material (though not on all the specimens), and which was frequently associated with a species of *Fusarium*.

Hill (J. B.), Brittingham (W. H.), Gibbons (Frances P.), & Watts (Grace W.). **Further notes on Bacterium tumefaciens and its host relationship.**—*Phytopath.*, xx, 2, pp. 179–186, 3 figs., 1930.

In continuation of the first-named author's previous studies [*R.A.M.*, vii, p. 767; viii, p. 408], the writers give additional facts concerning the migration of *Bacterium tumefaciens* in flowering tobacco (*Nicotiana affinis*) shoots. Seven strains of the organism were used. In every section examined numerous zoogloeae with rounded or irregular tips were found in the xylem vessels both above and below the puncture, which extended well into the wood. Within 15 minutes these bodies advanced 2·378 mm. through the xylem vessels above the puncture and 2·161 mm. below it. The zoogloeae correspond in size and shape to the intercellular spaces they occupy.

The subepidermal layer in the tomato plant affords a path of migration for the parasite, but not the deeper part of the cortex, though the pith was regularly invaded. On the other hand, passage along the tobacco stem is apparently effected only through

the pith. In *Ricinus communis* the zoogloeae are found in the pith and cortex, but apparently not in the subepidermal layer. Following inoculation, the galls produced within a given period are larger on tomato than on castor and tobacco, suggesting the probability of a correlation between the location of the path of migration and the size of the galls.

Young tomato stems and beef broth were inoculated with a culture of the peach strain of *Bact. tumefaciens* in order to compare the motility of the organism in culture and in the host tissue. After 18 hours bacteria in the hanging drop from the broth showed motility, while all those in the plant juice squeezed from the stem surface at the point of inoculation were non-motile.

After some information had been gained concerning the relative virulence of the strains as expressed by rapidity of gall formation, the peach and willow strains and the 'Wisconsin 2004' strain were selected for intensive study. The first-named gave macroscopic evidence of gall formation in three to five days, while the galls produced by the other strains were slower in developing (five to twelve days) and never attained the size of the former.

The average distance traversed by the zoogloeae of the peach strain in tobacco pith in 45 minutes was 2·2288 mm., compared with 1·1593 mm. for the Wisconsin 2004, and 0·79625 mm. for the willow strain. A distinct correlation was found to exist between the rate of migration and the size and rapidity of gall formation, the peach strain producing large galls in 20 to 30 days, while those formed by the other strains during the same period did not attain an appreciable size.

PEYRONEL (B.). **Gli zoosporangi nella Sclerospora macrospora.** [The zoosporangia in *Sclerospora macrospora.*]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 4, pp. 353–357, 1 fig., 1929.

In 1924 and again in 1926 the author claims that he succeeded in obtaining the zoosporangia of *Sclerospora macrospora* [*R.A.M.*, ix, p. 370] on fragments of the culms and leaves of infected wheat repeatedly washed in running water and finally placed in distilled water.

The sporangiophores emerged in groups through the stomata, originating from a small mycelial stroma which completely filled the hypostomatic cavity. They were densely massed together and markedly constricted at the base, owing to the pressure of the guard cells, so that they easily became detached, even before producing the zoosporangia. They were simple and either very short or sometimes elongated to double the length of the zoosporangia. Their production lasted only a very short while and depended upon the presence of very young, actively growing mycelium which had not yet produced oospores. The zoosporangia were lemon-shaped and had a very obtuse, almost truncated, papilla, and the biciliate zoospores quickly lost their cilia and became round.

The zoosporangiophores were formed in water and differed considerably from those described for other species of *Sclerospora*, in which they are formed in air.

Allison (C. C.) & Isenbeck (K.). **Biologische Spezialisierung von Puccinia glumarum tritici, Eriksson und Henning.** [Biological specialization of *Puccinia glumarum tritici* Eriksson and Henning.]—*Phytopath. Zeitschr.*, ii, 1, pp. 87–98, 1930.

Further investigations were carried out at Halle during 1928–9 in the biological specialization of yellow rust of wheat (*Puccinia glumarum*) [*R.A.M.*, ix, pp. 98, 99]. The trials were conducted in greenhouses at a temperature of 14° to 22° C. with a relative air humidity of 60 to 90 per cent.

Four collections of the fungus, viz., Paris 15640, Kleszczewo (Posen), Neukirch (near Danzig), and Svalöf (Sweden), were used for the mass-inoculation of some 350 wheat varieties. It was apparent from the results of the experiments [the technique of which is fully described] that three distinct physiological forms are comprised in these four collections, namely, II (Paris 15640), III (Neukirch), and I (Kleszczewo and Svalöf). Form I caused heavy infection of the Vilmorin 250 variety while sparing the other Vilmorins almost entirely; II was excessively virulent, producing severe injury on all the varieties tested; while III was only slightly infective to any of the wheats. Two of the eighty collections newly received from Madrid corresponded with form II, while a third (48) proved to be a new form, IV, causing heavy damage to a number of varieties but only slight injury to Hörning's Dickkopf, which further proved highly resistant to a Russian collection from Leningrad. Another new collection from Versailles was also identified as belonging to form II, while two more (from England and Saxony, respectively), apparently occupied an intermediate position between I and II.

The outcome of these experiments is briefly discussed from the standpoint of breeding for resistance to yellow rust.

Briggs (F. N.). **Inheritance of the second factor for resistance to bunt, Tilletia tritici, in Hussar Wheat.**—*Journ. Agric. Res.*, xl, 3, pp. 225–232, 2 graphs, 1930.

Continuing his studies of the factors involved in the inheritance of resistance to bunt (*Tilletia tritici*) [*T. caries*] in crosses with Hussar and Martin wheats [*R.A.M.*, ix, p. 446], the author states that by appropriate breeding tests a selection (1418) was isolated from a cross between Hussar and Hard Federation, which contains the second Hussar factor for resistance, the existence of which was indicated in previous experiments [ibid., v, p. 726], but does not possess the factor for resistance common to Hussar and Martin. This selection differs from Hussar in that, unlike the latter, it is not entirely immune from the strain of *T. caries* used in the experiments.

Selection 1418 was crossed with the susceptible Little Club, and a study of the F_2 and F_3 generations indicated that it differs from Little Club in one main factor for resistance, which, unlike the completely dominant Martin factor, allows about 50 per cent. of the heterozygous plants to become infected. Crosses of Martin with selection 1418 segregated in the F_2 and F_3 similarly to Hussar × Baart crosses, showing that the factors in Martin and

selection 1418, respectively, are the two main factors for resistance possessed by Hussar. The author suggests that the Martin factor common also to Hussar should be henceforth designated as *MM*, and the second Hussar factor as *HH*, so that Martin can be designated as *MMhh* and Hussar as *MMHH*.

It is pointed out that the isolation and study of as many different factors for resistance as possible would be a considerable aid in breeding resistant wheats in areas where several different biological strains of bunt occur.

Briggs (F. N.). **Inheritance of resistance to bunt, Tilletia tritici, in White Odessa Wheat.**—*Journ. Agric. Res.*, xl, 4, pp. 353–359, 1 graph, 1930.

In continuation of his study of the inheritance of resistance to *Tilletia tritici* [*T. caries*] in different varieties of wheat, the author briefly describes experiments with the F_1, F_2, and F_3 generations of a cross of an entirely immune strain of White Odessa and the susceptible White Federation. The results indicate that White Odessa differs from White Federation in one main dominant factor for resistance, and that this factor is similar in its effect to that in Martin [see preceding abstract], although it has not yet been established whether these two factors are identical or not. There was also some evidence of the presence in the cross of modifying factors.

It is pointed out that in all his work the author used the same collection of bunt which has been propagated at Davis, California, but it is not known whether it consists of one or more physiological forms.

Briggs (F. N.). **Breeding Wheats resistant to bunt by the back-cross method.**—*Journ. Amer. Soc. Agron.*, xxii, 3, pp. 239–244, 1930.

Encouraging results in the development of wheat strains resistant to bunt (*Tilletia tritici*) [*T. caries*] have been obtained at Davis, California [*R.A.M.*, v, p. 726] by back-crossing between commercial varieties (e. g., Baart) and the resistant Martin. In 1924 segregation took place among the progeny of a cross between Martin and Baart (made in 1922) in the ratio of 1 resistant : 1 susceptible. In 1925 the ratio was 3 resistant : 1 susceptible. In 1926 there was 1 homozygous to 2 heterozygous rows, the former being again crossed with Baart. In 1930 homozygous resistant rows of this cross will again be available, and it is further planned to put all new varieties suitable for commercial growing into the back-cross nursery.

Nicolas (G.). **Un parasite dangereux pour le Blé en Béarn 'Septoria glumarum Passer.'.** [A dangerous parasite of Wheat in Béarn, *Septoria glumarum* Passer.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 7, pp. 250–255, 1930.

Early in July, 1929, the writer received from Béarn (Basses-Pyrénées), ears of wheat showing numerous blackish spots on the glumes, which bore pycnidia containing the hyaline, elongated bi-

to tri-septate spores, measuring 21 to 27 by 2·3 to 2·5 μ, of *Septoria glumarum* [*S. nodorum*: *R.A.M.*, vii, p. 638]. This fungus was first observed in the Lower Pyrenees in 1926, on Ardito wheat in an allotment. In 1927 a severe attack occurred in a damp, low-lying situation. In 1928 it was observed that wheat sown in rows 0·30 m. apart was much more severely infected than where the distance between the rows was only 0·15 m.

The most susceptible varieties are generally those from strains of wheat of Parisian origin, e. g., H. 77, I 1, G 4, Bon Fermier, D D, and Vilmorin 23; the early-maturing Ardito was only attacked in consequence of the heavy manuring which it had received and which had prolonged its vegetative development. The resistant varieties include Carlotta, Hybride 32, Hybride 13, Gentile Rosso, Moyencourt, Riéti II, Vittorio Veneto, and Tilio.

PETERSEN (W.). **Die Bekämpfung der Getreidefusskrankheit.** [The control of foot rot of cereals.]—*Nachricht. über Schädlingsbekämpf.*, v, 1, pp. 33–34, 1930.

Brief notes are given on the foot rots of cereals caused by *Leptosphaeria herpotrichoides*, *Ophiobolus herpotrichus*, and *Fusarium nivale* [*Calonectria graminicola*] in Oberbarnim [Brandenburg], and their control. The two first-named fungi may be eliminated from the soil by judicious rotation with root crops, oats, or summer barley, while for the third the disinfection of the seed-grain with tillantin is recommended [*R.A.M.*, viii, p. 437; ix, p. 174].

BENNETT (F. T.). **Gibberella saubinetii (Mont.) Sacc. on British cereals.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 43–58, 2 figs., 1930.

A full account is given of the isolation in 1928 and 1929 of *Gibberella saubinetii* [*R.A.M.*, ix, p. 172] from wheat and barley grains grown in England, this being stated to be the first record of the occurrence of this fungus on home-grown cereals in Great Britain. In the autumn of 1929 it was also found attacking the bases of *Triticum monococcum*, wheat, and barley plants in the eastern Counties.

The fungus was grown in pure culture on various media [details of which are given], and starting from single conidium and single ascospore cultures went through its entire life-cycle. Cross-inoculation experiments, which are still being continued, indicated that the forms on wheat and barley are identical. A detailed description is given of the morphology of the fungus.

HEWLETT (C. H.). **Hot-water treatment of seed Barley. Field experiments in Canterbury, season 1928–29.**—*New Zealand Journ. of Agric.*, xl, 2, pp. 104–107, 1930.

This is a brief report of the practical results obtained in the attempt which was made in the 1928-9 season [*R.A.M.*, viii, p. 97] to eliminate covered smut [*Ustilago hordei*] from the bulk of the malting barleys at Canterbury, New Zealand, for which purpose both the Canterbury Seed Company and New Zealand Breweries,

Ltd., in their sowing contracts, used seed 'once removed from treatment' [loc. cit.] and 'direct from treatment'. The treatment applied to the latter was a pre-soaking of five hours in water at 60° to 70° F., followed by a dip of five minutes at 127°. The total area under treated seed was 4,331 acres, representing 70 per cent. of the North Canterbury barley area, of which 4,181 were sown with seed 'once removed from treatment' and 150 with directly treated seed. The average yields per acre were 60·9 bushels for the seed direct from treatment, 53·23 bushels for the once-removed seed, the total average being 53·5 bushels (mill firsts only) as compared with an average of 45·87 bushels (including mill seconds) shown by the Government Statistician for the whole of the Canterbury district (9,561 acres, including the acreage under treated seed).

Inspection of the crops during the season showed that all the barley raised from seed direct from treatment was absolutely free from smut. A slight trace of smut was found in a crop once removed from treatment which had been threshed in a mill whose structure did not allow of its being thoroughly cleaned and disinfected, but in no case was smut found when the seed was threshed in a properly cleaned and disinfected mill.

Taylor (J. W.) & Zehner (Marion G.). **The effect of a seed disinfectant on grain and straw yields and smut control in winter Barley.**—*Journ. Amer. Soc. Agron.*, xxii, 2, pp. 113–123, 1 fig., 1930.

Excellent control of loose and covered smuts (*Ustilago nuda* and *U. hordei*) of winter barley was obtained in five years' experiments (1924–28, inclusive) [the results of which are tabulated and discussed] at Rosslyn, Virginia, by seed treatment with semesan (one hour's immersion in a 0·3 per cent. solution) [*R.A.M.*, v, p. 222]. An increase of 11·6 per cent. in the grain yield was obtained by treating the seed of the susceptible varieties and an average increase of 5·3 per cent. in the resistant varieties tested during the five-year period. Most of this gain was obtained in the low-yielding Nakano Wase variety, no significant increase accruing from the treatment of the more productive Orel.

The average amount of the combined smuts in the susceptible varieties was 4 per cent. greater than the percentage increase in grain yield from seed treatment. Considerable divergence was shown in individual years in the correlation between smut infection and reduction of yield. In 1926, the susceptible Tennessee Winter sown on 26th September contained a combined total of 17·5 per cent. of smut in the untreated plots compared with none in the treated ones, but no increase of grain yield was obtained in the latter. The same variety sown on 28th September on a more productive soil showed 37·2 per cent. more smut in the untreated than in the treated plots, while the latter yielded almost 75 per cent. more grain than the controls. Straw yields from the untreated seed were relatively higher than grain yields, but some reduction in the former, apart from the loss of chaff due to loose smut, probably occurs in diseased plants.

Levine (M. N.), Stakman (E. C.), & Stanton (T. R.). **Field studies on the rust resistance of Oat varieties.**—*U.S. Dept. of Agric. Tech. Bull.* 143, 35 pp., 3 diags., 1 map, 1930.

A uniform nursery experiment was initiated in 1923 to determine under field conditions in different parts of the United States and eastern Canada the relative resistance of oat varieties to stem rust (*Puccinia graminis avenae*), and the distribution of physiological forms of the fungus in each place. From 1925 onwards similar observations were also made on crown rust (*P. coronata avenae*) [*P. lolii*: *R.A.M.*, viii, p. 449]. Altogether 23 varieties were tested at 65 different experiment stations.

The intensity of stem rust was usually estimated before the plants ripened, while crown rust counts were made when the leaves were still green. The standard six-degree (5, 10, 25, 40, 65, and 100 per cent.) rust scale of the Office of Cereal Crops and Diseases, Bureau of Plant Industry, was used for the estimates. With stem rust, notes were taken on the nature of host reaction in addition to the estimates of infection. An infection coefficient was obtained by the multiplication of the numerical value assigned to the host reaction by the estimated percentage of stem rust. The percentage reading, however, was considered adequate to represent susceptibility to crown rust. To give a better basis of comparison in different years and different localities, the average infection of each variety was compared with that of the susceptible Silvermine in each nursery.

The degree and nature of stem rust infection were found to vary greatly according to the variety, the season, and the place of cultivation. The following eight varieties, selections, and crosses were most resistant (in descending order) to *P. graminis* (infection coefficients from under 0·5 to slightly over 3 per cent.): Iogold, Hajira, Richland, Minota × White Tartar (White Russian), White Tartar, Green Mountain, Anthony, and Edkin. Compared with Silvermine their susceptibility ratios ranged from 1·39 per cent. for Iogold to 12·12 for Edkin. The Kanota, Iogren, Ruakura, Red Rustproof, Markton, and Swedish Select varieties proved highly susceptible.

Considerable differences were found to exist between the relative susceptibility ratios, when compared with Silvermine, of the most resistant and most susceptible varieties to crown and stem rust, respectively, the lowest and highest ratios for the former being 82·97 and 129·69 per cent. and for the latter 1·39 and 111·58 per cent. The six varieties least affected by *P. lolii* were Green Mountain, Red Rustproof, Iowar, 'Rustless selection', Burt, and Ruakura. In general, there was no apparent correlation in varietal resistance between the two rusts, some of the varieties most resistant to stem rust being among the most susceptible to crown rust, and vice versa. The Markton variety, however, was the most susceptible in both cases.

Stem rust specimens were collected each year (121 in all) from the different nurseries and the identity of the physiological forms determined by inoculations in the greenhouse at University Farm, St. Paul, Minnesota. Physiological forms I, II, and V were isolated in the different years, II being by far the most prevalent [ibid.,

viii, p. 365]. None of the extremely virulent forms known to occur abroad and in Canada has been definitely identified in the United State collections, though there is considerable circumstantial evidence of their occurrence in the latter country. Generally speaking, there appears to be no correlation between smut [*Ustilago avenae* and *U. kolleri*] and rust resistance, Hajira being the only variety showing resistance to both diseases. The rust-susceptible Markton and Fulghum were very resistant to both smuts. Red Rustproof was highly resistant to both smuts and to crown rust but very susceptible to stem rust, while Green Mountain was susceptible to both smuts but resistant to both rusts. Anthony and Ruakura were very susceptible to the smuts, the former also being susceptible to crown rust, and the latter to stem rust.

Owing in part to the progress of barberry eradication, the reduction of oat yields from stem rust is now less heavy than formerly, but the programme of breeding varieties resistant to both *P. graminis* and *P. lolii* must be continued in order still further to diminish the losses from these diseases.

Stranák (F.). **Die Frage der Trockenbeizung des Hafers gelöst.** [The problem of dusting Oats solved].—*Nachricht., über Schädlingsbekämpf.*, v, 1, pp. 27–28, 1930.

The results of six experiments in Czecho-Slovakia in the control of loose smut of oats [*Ustilago avenae*] by hafertillantin are stated to have been highly satisfactory [cf. *R.A.M.*, viii, p. 640]. The preparation was found to be simple in application and to give absolute protection against infection.

Bienko (F.). **Ein interessanter Versuch über die Wirksamkeit von Trockenbeizmitteln gegen Haferflugbrand.** [An interesting test of the efficacy of dusts against loose smut of Oats.] —*Nachricht. über Schädlingsbekämpf.*, v, 1, pp. 31–33, 1930.

Perfect control of loose smut of oats (*Ustilago avenae*) was given in an experiment near Rostock by the application of hafertillantin [see preceding abstract] at the rate of 160 gm. per 20 sq. m. The incidence of infection in the control plot sown with inoculated seed-grain was 36 per cent.

Reed (G. M.). **Reports on research for 1929. Plant pathology.** —*Nineteenth Ann. Rept. Brooklyn Bot. Gard., 1929* (*Brooklyn Bot. Gard. Record*, xix, 2), pp. 55–60, 1930.

The author's studies on the inheritance of resistance to the loose and covered smuts of oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]) have been continued [*R.A.M.*, viii, p. 487]. The most interesting new combination involved a cross between Early Gothland and Monarch, the former being very susceptible to the loose smut but resistant to the covered, while the latter shows exactly the reverse behaviour with regard to the two fungi. A few F_2 plants of a cross between these two varieties were grown, one set having been inoculated with *U. avenae* and the other with *U. kolleri*. The combined results for the loose smut with the reciprocal inter-varietal crosses gave 9 infected plants out of a total of 50, and for the covered smut 9 out of 85.

A great many F_3 progenies of various crosses were grown during the past season, including 34 of Early Gothland (resistant) × Victor (susceptible) and 102 of Early Gothland × Hull-less (susceptible), all of which were inoculated with *U. kolleri*. In the former cross less than 25 per cent. of the F_2 plants were infected, while in the latter the incidence of smut considerably exceeded this figure. In the F_3 generation the first cross yielded an exceptionally large number of resistant families, while in the second there were comparatively few.

Other F_3 progenies comprised 243 of the hybrid Monarch × Hull-less inoculated with *U. avenae*, 99 of Fulghum × Black Mesdag inoculated with the Fulghum strain of loose smut [ibid., ix, p. 372], 67 of Silvermine × Black Mesdag, and 55 of Early Champion × Black Mesdag inoculated with *U. avenae*. In the two last-named hybrids, seed of most of the same progenies was also inoculated with *U. kolleri*. Generally speaking, the results obtained with these progenies are in conformity with the data secured on the F_2 plants. The second generation of Monarch × Hull-less gave slightly over 30 per cent. infected individuals, and among the F_3 progenies there was an excess of segregating and susceptible families. The progenies of Silvermine and Early Champion × Black Mesdag reacted similarly to both loose and covered smut.

Second generation progenies of 16 different sorghum crosses of diverse parentage were inoculated with covered smut [*Sphacelotheca sorghi*: ibid., vii, p. 560]. The results were very divergent. For instance, a cross between the two susceptible varieties, Dawn Kafir and Red Amber Sorgo, gave 60·9 per cent. infection, corresponding fairly closely with the incidence of disease in the former parent and somewhat higher than that occurring in the latter. The Feterita × Sumac Sorgo and Feterita × Dawn Kafir hybrids gave approximately 50 per cent. infection, a lower rate than that occurring in the susceptible parent. Feterita × Brown Durra, Feterita × Manchu Kaoliang, and Feterita × Red Amber Sorgo gave relatively low percentages of infection (13·8 to 22·8 per cent.). In all the combinations in which Milo varieties were used as the resistant parent, low percentages of infection developed. These results would appear to indicate that the mode of inheritance depends on the varieties used in the original cross.

Heller (V. G.), Caskey (C.), & Penquite (R.). **The possible toxicity of Grain-Sorghum smuts.**—*Journ. Agric. Res.*, xl, 4, pp. 347–351, 3 graphs, 1930.

The results of experiments in 1927 [details of which are given] showed that a diet in which as much as 10 per cent. of the normal carbohydrates were replaced by an equal amount of spores of sorghum kernel smuts [*Sphacelotheca cruenta* and *S. sorghi*: *R.A.M.*, iv, p. 158] had no deleterious effect on the growth, reproduction, and rearing of the young of rats, guinea-pigs, and rabbits. Toxic effects also failed to appear when horses, cows, and young cattle were fed on smutty sorghum grain and fodder over a period of 12 weeks, and in chickens which received rations prepared with smutty sorghum grain. The young animals grew as well as the controls, the old animals maintained their weight,

and no reduction was noticed in the production of eggs in the hens or of milk in the cows used in the experiments.

KIESSELBACH (T. A.). **Field tests with treated seed Corn.**—*Journ. Agric. Res.*, xl, 2, pp. 169–189, 1930.

In this paper [compiled on similar lines to the preliminary report: *R.A.M.*, vi, p. 661] the author summarizes the results of the investigation from 1925 to 1928 of the efficacy of the treatment of maize seed with mercuric compounds in the control of seed-borne diseases, among which the *Diplodia* [*zeae*] seedling blight is stated to be the most prevalent in Nebraska. The fungicides tested under field conditions were uspulun (liquid), and Bayer dust, semesan jr. or improved semesan jr., and merko (dry).

Experiments in 1928 confirmed the non-systemic nature of the *Diplodia* disease, since maize plots raised from infected seed did not show significant deterioration in vigour or serious losses in yield in the surviving plants, as compared with parallel plots raised from selected nearly disease-free seed of the same variety, although the stand of the former was thinned out by 35 per cent. owing to seedling blight. Treatment of the infected seed with the three dust compounds improved the stand by an average of 18 per cent. and lowered the yield by half a bushel per acre, when tested in multiple row plots; in corresponding alternating single row plots, however, the treated seed yielded 4·5 bushels more per acre than the untreated. This difference in effect on yield is considered to represent an experimental error of 5 bushels due to plot competition between unlike stands in the case of the single row plots. The general inference drawn from these experiments is that the beneficial effect of the seed treatment was limited to the germination and seedling stages of the plants, and that the treatment failed to increase the yield or to improve materially the growth and health of the surviving plants and the quality of the grain produced by them [cf. ibid., iv, p. 119].

Experiments in which 141 samples of farm-selected maize seed were tested for response to seed treatment during the four years of the investigation showed that the treatment increased the field stand and the yield only by insignificant amounts. The treatment did not have any significant practical effect upon such characters of the crops as vigour and size of the plants, earliness of maturity, percentages of smutty, barren, lodged, broken, and diseased plants and quality of grain produced.

REDDY (C. S.). **Fungicidal efficiency of chemical dusts containing furfural derivatives.**—*Phytopath.*, xx, 2, pp. 147–168, 2 figs., 2 graphs, 1930.

This is an expanded account of the tests already noticed briefly [*R.A.M.*, ix, p. 373] of organic mercury compounds, containing an organic radical derived from furfural, in the control of the dry rot seedling blights of maize, caused by *Diplodia zeae*, *Gibberella saubinetii*, *Basisporium gallarum* [*Nigrospora sphaerica*], *Fusarium* [*moniliforme*: *G. moniliformis*], and *Cephalosporium* [*acremonium*].

Petri (L.). **Sulla posizione sistematica del fungo parassita delle piante di Limone affètte da 'mal del secco'.** [On the systematic position of the fungus parasitic on Lemon trees affected with 'mal del secco'.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 4, pp. 393–396, 1 fig., 1929.

The author states that the fungus causing the tracheomycosis of lemon trees affected with 'mal secco' disease in Sicily [*R.A.M.*, ix, p. 300] forms round, black, gregarious pycnidia 0·03 to 0·09 mm. in diameter on the surface of the scars left where the leaves have fallen or on the twigs themselves, provided *Colletotrichum gloeosporioides* has not developed in the cortical tissues. The affected parts appear as grey, longitudinal strips. The pycnidia are composed externally of one or two layers of dark hyphae inside which is a white pseudoparenchyma of irregularly rounded cells. Their structure resembles that of a sclerotium, except that the consistency is less hard than in true sclerotia or the immature pycnidia of the Sclerophomaceae. No clearly differentiated sporophores are developed, the pycnospores arising directly from the surface of the peripheral cells of the central pseudoparenchyma after a cavity has been formed by the gelatinization of the walls of the cells of the central part. Each cell gives rise by budding to numerous bacteriform, hyaline spores, measuring 2·3 to 4 by 0·8 to 1·5 μ. The mature pycnidia consist only of a thin wall enclosing very numerous spores which, as an ostiole is lacking, remain shut until, after rain, they swell, lift the epidermis, and open irregularly owing to the pressure from within.

The author considers that the fungus belongs to a new genus related to Moesz's *Plectophomella* but distinguished from the latter by the lack of branched hyphae similar to paraphyses in the pycnidium. He names it *Deuterophoma tracheifila*, Latin diagnoses of the genus and species being given.

Petri (L.). **La riproduzione sperimentale del 'mal del secco' dei Limoni.** [The experimental reproduction of 'mal del secco' of Lemons.]—*Rendic. R. Accad. Lincei*, xi, Ser. 6, 2, pp. 146–149, 1930.

After repeating that primary infection in the 'mal secco' disease of lemons in Sicily is brought about by *Deuterophoma tracheifila* [see preceding abstract], to which the later anthracnose stage caused by *Colletotrichum gloeosporioides* is secondary, the author briefly describes inoculation experiments in which young sour oranges [*Citrus bigaradia*], which are highly susceptible to 'mal secco', were grown in pots, the soil varying from pure sand to pure clay, with ammonium sulphate added (to reproduce to some extent the forcing methods practised in Sicily), and inoculated with mycelium or with pieces of infected wood in October 1929, in which month natural infections are commonest. Early in January, 1930, the tips of the branches of two of the inoculated plants withered; the typical orange-red discoloration of the wood was observed, and the mycelium of *D. tracheifila* was found in the vessels, from which it was reisolated. The tendency of the fungus to spread towards the base of the plants was very noticeable and, in the

absence of *C. gloeosporioides*, only the symptoms of tracheomycosis were produced. Altogether one-third of the inoculations were successful, all types of soil being represented.

STANFORD (H. R.). **Warning on scaly bark treatments.**—*California Citrograph*, xv, 3, p. 119, 1930.

Tests conducted in California since 1928 for the control of psorosis of orange trees [*R.A.M.*, vii, p. 508; viii, p. 640] by the application of various fungicides after scraping showed that lime-sulphur paste gave good results except in one locality where it caused a certain amount of injury owing to a combination of high air temperature and humidity. The heat volatilized the polysulphides present, producing sulphur dioxide, which united with the atmospheric moisture to produce sulphurous or sulphuric acid, both of which are injurious to bark and may kill the wood. Atomic sulphur gave equally good results without this drawback, as it volatilizes much more slowly.

Two years' tests in one orchard confirmed the superiority of atomic sulphur over the other substances tried. That psorosis is curable was demonstrated by the fact that numerous trees have shown no return of the symptoms five years after treatment.

Concentric ring blotch of Citrus.—Reprinted from *Farming in South Africa*, February, 1930, 6 pp., 6 figs., 1930.

A fully illustrated account is given in popular terms of the symptoms and incidence of concentric ring blotch of citrus [*R.A.M.*, v, p. 487] in South Africa, as it affects sweet orange, rough lemon, and grapefruit. On the leaves the disease impedes nutrition, while affected fruit may be unmarketable, though fortunately only nursery stock and young trees are usually attacked and they tend to recover as they grow older. Experiments indicate that the chief predisposing factors are probably climatic and soil conditions. The only treatment at present recommended lies in ploughing-in green manure before planting, a measure which experience has shown to be effective in reducing the disease.

STOUGHTON (R. H.). **Apparatus for the growing of plants in a controlled environment.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 90–106, 2 pl., 7 figs., 1930.

The author gives a full description, together with constructional details, of an apparatus elaborated from that described in a previous paper [*R.A.M.*, viii, p. 36] for the study of the angular leaf spot disease of cotton (*Bacterium malvacearum*) under controlled environmental conditions [ibid., ix, p. 377]. The apparatus, which controls the physical factors, soil temperature, air temperature and humidity, and light, consists of three main parts, namely, a soil temperature tank of the 'Wisconsin' type, but with considerable modification; an air chamber; and a lighting installation. Although primarily designed for the study of the bacterial disease of cotton, it is believed that the apparatus, with slight modifications, may be

easily adapted to the investigation of other plant diseases demanding the maintenance of constant environmental conditions.

YAKUSHIGI (E.) & KUMAZAWA (M.). **Über einige im Koishikawa botanischen Garten gesammelte Isaria-Arten. I.** [On some *Isaria* species collected in the Koishikawa Botanic Garden. I.]—*Bot. Mag.*, Tokyo, xliv, 517, pp. 40–42, 2 figs., 1930.

The following species of *Isaria* were collected during the period from July to October, 1929, in the Koishikawa Botanic Garden, Tokyo: *I. cosmopsaltriae* Yasuda = (?) *Cordyceps sobolifera* (Hill.) Berk. on cocoons of *Meimuna oparifera* Wk. (*Cosmopsaltria oparifera* Wk.) and very rarely on those of *Onchotympana maculaticollis* Mats. (*Pomponia maculaticollis* Mats.); *I. atypicola* Yasuda, with which *I. pachylomera* Kawamura is regarded as synonymous [*R.A.M.*, viii, p. 468], on *Kishinoyeus typicus* Kishida, the previous determinations of the spider hosts as *Atypus* and *Pachylomerus* being stated by Kishida to have been incorrect, and *I. nigra* n. sp. [a German diagnosis of which is given] on *Carabus gehini*.

MAURIZIO (ANNA). **Einige Pilze aus dem Bienenstock.** [Some fungi from the beehive.]—*Mitt. Naturforsch. Gesellsch. Bern, 1929*, pp. xxiii–xxv, 1930.

Some of the more important fungi occurring in beehives, where the constant high temperature favours their development, are briefly described. Certain species of *Aspergillus*, e.g., *A. niger*, and *A. flavus*, may assume a parasitic form, the latter transforming the embryos into dry, hard, yellowish-green mummies and also attacking adult bees [*R.A.M.*, iii, p. 336].

Pericystis apis [ibid., v, p. 300] primarily infects drones in all stages of development, converting them into hard, greyish-white mummies on the surface of which the fructifications are formed. The taxonomy and cytology of *P. apis* are not yet completely understood, but the fungus has been tentatively referred to the Entomophthoraceae.

P. alvei, probably related to the foregoing, is widespread in England, Switzerland, Germany, and France, while a very similar fungus has recently been described by Burnside in America under the name of *Ovularia farinaecola*. *P. alvei* (also known as the pollen fungus) occurs during the winter and spring as a white, floury coating on the pollen cells in the corners of the honeycomb. The organism, which has a predilection for low temperatures, turns the infected pollen into a hard, dry mass adhering so firmly to the cell that the bees are compelled to gnaw away the walls in order to remove it. Cultures of *P. alvei* on honey agar showed it to be heterothallic, like *P. apis* as described by Claussen in 1921. The mycelium consists of hyaline, septate, branched hyphae forming apical, lateral, and intercalary chlamydospores. Fructifications (cysts) develop from the fusion of heterosexual mycelia. The mature cyst is an irregular, greenish-brown to black sac, from which are appended two to four dark-coloured hyphal processes; it contains one or more clusters of round, thick-walled spores

which have not yet been induced to germinate. The possibility of a symbiotic relationship between *P. alvei*, a permanent occupant of the hive, and the bees is suggested.

PUNTONI (V.). **Sur la pluralité des types de l'Actinomyces bovis.** [On the plurality of types of *Actinomyces bovis*.]—*Comptes rendus Soc. de Biol.*, ciii, 5, pp. 303–305, 1930.

The outcome of researches conducted at the Bacteriological Institute, Rome, with twenty cultures of *Actinomyces bovis* indicated that this name is misleading, since it has been applied indiscriminately to a number of quite distinct strains which the writer has identified as belonging to *A. sulphureus* Gasperini, *A. albus* Rossi-Doria, *A. chromogenes* Gasperini, *A. albido-flavus* Rossi-Doria [*R.A.M.*, viii, p. 575], *A. carneus* Rossi-Doria, and *A. luteo-roseus* Gasperini. The separation of the Actinomycetes into saprophytes and parasites is also deprecated as artificial, the pathogenicity of the latter being considered to be merely induced by certain environmental conditions and in no sense inherent.

SANGIORGI (G.). **Osservazioni sulle cosidette forme di 'Blastocystis' dell' intestino umano.** [Observations on the so-called forms of *Blastocystis* of the human intestine.]—*Ann. d'Igiène*, xl, 3, pp. 179–182, 1 pl., 1930.

The study of a large amount of material has convinced the author that the blastocysts occurring in the human intestine represent various phases in the life-cycle of the fungus, *Blastocystis hominis* [*R.A.M.*, v, p. 98]. The dimensions of the bodies were found to range from 5 to 6 μ for the 'small' individuals to 35·2 μ for the 'giant' forms, intermediate forms being also present. The presence of glycogen within the cells was established. These observations largely confirm the work of Alexeieff (*Bull. Soc. Franç. et Belg.*, 1911; *Arch. Zool. Expér.*, lxi, 1917) and refute the view that the blastocysts are of insect, protozoan, or unknown origin.

OGATA (S.). **Über die Trichophytie in der Umgegend von Chiba mit besonderer Berücksichtigung über ihre Erreger.** [On trichophytosis in the vicinity of Chiba with special reference to its causal organisms.]—*Japanese Journ. of Dermatology*, xxix, 12, pp. 1183–1232, 1 col. pl., 25 figs., 1 map, 1929. [Japanese, with German summary on pp. 80–84.]

The causal organisms were determined in 311 cases of ringworm in the Chibi district of Japan. They were *Trichophyton violaceum* (74 cases), *T. glabrum* (15), *T. coccineum* Katoh (18), *Microsporon japonicum* Dohi et Kambayashi (22) [*R.A.M.*, vii, p. 169], *T. gypseum asteroides* (21), *T. interdigitale* (24), *T. purpureum* (118), *Epidermophyton inguinale* (16), *T. fuligineum* n. sp. (1), and *T. gypseum asteroides* var. *chibaense* n. var. (2). *T. interdigitale* was isolated for the first time from three cases of onychomycosis, *T. purpureum* from 22, and *T. violaceum* and *T. glabrum* from one each.

T. fuligineum is characterized by long, crooked, septate hyphae, 3 to 4 μ in width, intercalary and pediculate chlamydospores of the

same dimensions as those of *T. violaceum* and *T. glabrum*, and concatenate spores 4 to 5 μ in diameter.

T. gypseum asteroides var. *chibaense* is characterized by septate hyphae, 3 to 4 μ in width, round or oval aleuria, 3 μ in diameter, and pluriloculate spirals. The colonies of the fungus are yellowish-brown, with a crateriform centre and a markedly rugose periphery on Pollacci's medium.

FLECK (L.). **Ein Fall von Pseudosyphiloma anorectale mykotischer Ätiologie (Kladiosis).** [A case of anorectal pseudosyphiloma of mycotic etiology (cladiosis).] — *Dermatol. Wochenschr.*, xc, 11, pp. 379–382, 3 figs., 1930.

A species of *Scopulariopsis* [*R.A.M.*, v, p. 300; viii, p. 573], characterized by long, irregularly septate, branched hyphae, 2 to 6 μ in width, moniliform spores, 4 to 6 μ in diameter, borne on a short stalk and forming flagelliform chains, and round or oval, highly refractive chlamydospores, 2 to 6 μ in diameter, was isolated from abscesses in the anorectal region of a young female patient and is believed to have been the cause of the condition.

ATKINS (W. R. G.). **The preservation of fishing nets by treatment with copper soaps and other substances. Part II.**— *Journ. Marine Biol. Lab.*, Plymouth, N.S., xvi, 2, pp. 583–588, 1930.

The results of the writer's continued experiments in the preservative treatment of fishing nets against rotting in aquarium tank water are discussed and tabulated [*R.A.M.*, vii, p. 514].

The most efficient preservative in a single treatment is a mixture of copper soaps and tar, either: (A) 1 lb. of copper soap of mixed fatty acids (Pilot Protective Copper Soap, supplied by Ogston and Tennant, Renfrew, and, in a modified form based on an American formula, by W. Bailey & Son, Wolverhampton), dissolved in 1 gall. petrol or gas-works benzol. This gives a solution of approximately 12 per cent. of copper, to which 1 lb. of tar per gall. is afterwards added. (B) Cuprinol may be substituted for the fatty acid soap; it is more expensive than the latter but also more effective in sea water. This substance may be used alone but is improved, especially for hemp nets, by the addition of tar at the rate of 1 lb. per gall. of mixed cuprinol. Hemp and cotton nets treated by these methods have lasted three years when allowed to soak in jars of aquarium sea water changed three times a week.

Efficient preservation of cotton nets, with maintenance of the original strength for three years, was also given by treatment according to Dr. Olie's method, renewed every four months. The nets are boiled twice in cutch [a 2 per cent. infusion of tannin extract], being allowed to dry in between each boiling, and then soaked for 15 minutes in a 1 per cent. solution of copper sulphate, with the addition of about 6 oz. by weight of strong ammonia.

'Neo-Russigen', an oily substance supplied by the Ministry of Fisheries (without a chemical analysis) proved superior to cutch alone but far less effective than copper soap and tar.

Fischer (R.). **Phytopathologische Mitteilungen. I. Über Krankheiten des Anthurium scherzerianum.** [Phytopathological notes. I. On diseases of *Anthurium scherzerianum.*] —*Zentralbl. für Bakt.*, Ab. 2, lxxx, 8–14, pp. 245–252, 11 figs., 1930.

Anthurium scherzerianum, grown under glass in the park of Schönbrunn, Vienna, is stated to be subject to infection by various organisms. *Cephaleuros parasiticus* [the morphology of which is briefly described] produces raised, clay-coloured spots, with lobate margins, up to 2 cm. in size, especially on the upper side of the leaves. Much of the algal thallus is intramatrical and some of the host cells are filled to such an extent by the parasite that the cells of the latter assume a polygonal aspect in consequence of mutual arrest of growth. The spots produced by *C. parasiticus* occur mostly in the channels bordering the mid-rib of the leaf, where water collects. Infection was found to occur through the epidermal glands, and the alga extends at first between the cuticle and epidermis and then penetrates the epidermal cells. The filaments, which often occur in the form of dense fascicles, rupture the cell walls of infected cells and in moist weather emerge through the epidermis. Ultimately the spots become suberized, after division of the epidermal cells into several layers and the formation of a phellogen between the epidermis and mesophyll so as to form raised ochraceous or brown areas, from which the greenish-yellow algal filaments protrude. Should cork formation be delayed, the parasite may penetrate the mesophyll by means of elongated, rhizoid-like filaments, which produce local necrosis.

Gloeosporium minimum [cf. *R.A.M.*, v, p. 558] forms round, brown (later ashen-grey) spots, sometimes surrounded by a reddish-orange halo and encircled by a raised cork zone, on the leaves of *A. scherzerianum*. *Physalospora anthurii* n. sp. was frequently found as a saprophyte on the *Gloeosporium* spots, but there appears to be no genetic connexion between the two fungi. It is characterized by hyaline, elliptical to oval conidia, 11 to 17 by 5 to 7 μ in diameter; pycnidia measuring 210 to 230 by 160 to 170 μ and producing bacilliform pycnospores, 6 to 9 by 0·9 to 1·3 μ; and globular to ellipsoid, dark brown perithecia, 115 to 130 by 80 to 100 μ (average 110 by 85 μ) with asci 57 to 64 by 12 to 14 μ in diameter, accompanied by filamentous paraphyses, and containing eight unicellular, elliptical or oval ascospores, measuring 13 to 15 by 5 to 6 μ.

In the mesophyll cells of circular or semi-circular, reddish-brown, raised, concentrically zonate lesions occurring on some *Anthurium* leaves hyaline structures, 4 to 8 μ in diameter, were found in clusters, and also spherical bodies, 30 to 35 μ in diameter, surrounded by a coarse, hyaline wall. The nature of these bodies has not yet been determined, but they are believed to be of parasitic origin.

Muncie (J. H.) & Patel (M. K.). **Fasciation of Sweet Peas.**— *Amer. Journ. of Botany*, xvii, 3, pp. 218–229, 1930.

Isolations from the neck or base of the fasciation frequently observed in a number of varieties of greenhouse sweet peas yielded

mostly *Fusarium* spp., but occasionally bacteria resembling *Pseudomonas* [*Bacterium*] *tumefaciens* were obtained in pure culture [*R.A.M.*, vi, p. 422]. Plants grown from disinfected seed in sterilized soil were inoculated with cultures of the various organisms isolated from fasciated plants, as well as with *Rhizoctonia* [*Corticium*] *solani*, the raspberry strain of *Bact. tumefaciens*, and twelve non-pathogenic bacteria closely resembling the latter [ibid., viii, p. 705]. Fasciation developed on some of the inoculated plants and also on the uninoculated controls, grown from sterilized seed in sterilized soil, showing that the condition may develop independently of the crown gall or other organisms. The bacteria resembling *Bact. tumefaciens*, isolated from fasciated sweet peas, failed to produce crown gall when inoculated into young beet and tomato plants. No evidence of seed transmission of fasciation was obtained, but there is some indication that the abnormality may be due to congestion in the flower-pots.

McKenny Hughes (A. W.). **Aphis as a possible vector of 'breaking' in Tulip species.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 36–42, 1 pl., 1930.

The results of preliminary experiments in 1929 at the John Innes Horticultural Institution indicated that the aphid *Myzus persicae* was able to transmit the disease known as 'breaking' in tulips [*R.A.M.*, viii, p. 788], since 13 out of 52 healthy tulip plants of the Bartigon variety were successfully infected by it. There was some evidence to suggest that *Macrosiphum gei* may also be a vector of the disease, since 5·6 per cent. of the tulip plants tested with it produced definite symptoms of 'breaking'. The other two species of aphids tested, namely, *Rhopalosiphoninus tulipaella* and *Anuraphis tulipae*, gave negative results.

Pinkhof (Marianne). **Untersuchungen über die Umfallkrankheit der Tulpen.** [Investigations on the falling disease of Tulips.] —*Recueil Trav. Bot. Néerlandais*, xxvi, 2–3–4, pp. 135–288, 3 pl., 2 figs., 15 diags., 2 graphs, 1929.

A very comprehensive account, accompanied by forty tables, is given of the writer's researches, conducted from 1927 to 1929 at the Flower Bulb Investigation Laboratory, Lisse, Holland, on the so-called 'falling' disease of tulips, especially of the Murillo variety. The outstanding features of this disease, which causes very heavy losses (practically 100 per cent. under certain conditions) in the greenhouse, are the water soaking of a part of the stem, mostly in the upper internode, often accompanied by the exudation of liquid and followed by shrivelling of the stem and consequent collapse of the inflorescence.

The secretion exuded from the diseased stems, in which it occupies the intercellular spaces, was found to contain saccharose, monoses [saccharides], and frequently gum. In some cases the sugar concentration of the drops is extremely high [cf. *R.A.M.*, vii, pp. 173, 517], and they may, in fact, be compared to a thick syrup. The ratio of saccharose to glucose in the drops, however, is fixed, the value of the quotient always being about 1, even in a case where a cut tulip was grown on a monose solution.

The results of this sugar secretion are a loss of turgor in the parenchyma, chlorenchyma, and collenchyma cells. In no case was the disease observed to occur in the absence of abnormal sugar relations in the affected part of the stem, and it is attributed to an abrupt disturbance of the natural development of the flower bud through the forcing process. This is elucidated by a study of the carbohydrate relations between the bulb and the flower bud.

The incidence of the falling disease is greatly augmented by high temperatures in the greenhouse, less by humidity. Predisposition to the disease, however, is of an hereditary nature.

Togashi (K.) & Onuma (F.). **A new species of Urocystis on Convallaria majalis. L.**—*Japanese Journ. of Botany*, v, 1, pp. 21–26, 1 fig., 1930.

In June, 1928, lily of the valley (*Convallaria majalis*) plants growing at an altitude of 1124·5 m. in the province of Rikuchu, Japan, were observed to be suffering from arrested growth and a yellowish-green discoloration. The leaf blades and sheaths bore large groups of minute greyish sori of a smut along the parallel veins. The fungus, which is named *Urocystis miyabeana* n. sp., is characterized by granular, blackish-brown spore masses underlying the epidermis; subglobose or ellipsoidal spore balls, 17 to 37 by 15 to 34 μ (generally 20 to 30 by 19 to 27 μ), deeply embedded in the mesophyll; subglobose, ellipsoidal, or rarely discoidal, light brownish-yellow, sterile cells, closely surrounding the spores, usually 6 to 25 around the spore ball, each cell 6 to 16 by 5 to 14 μ (generally 8 to 11 by 6 to 10 μ), membrane 1 to 1·5 μ thick; globose or ovoid, dark brown spores, 1 to 4 (usually 1 to 2) in a ball, each spore 11 to 22 by 10 to 18 μ (generally 13 to 17 by 11 to 16 μ), with a smooth membrane, 2 μ thick. The differences between the lily of the valley fungus and the related species, *U. colchici*, *U. jaapiana*, and *U. trillii*, are shown by means of a table.

Dodge (B. O.) & Swift (Marjorie E.). **Further notes on Iris troubles.**—*Journ. New York Bot. Gard.*, xxxi, 362, pp. 25–34, 3 figs., 1930.

Almost complete control of *Sclerotium delphinii* on irises [*R.A.M.*, ix, p. 38] at the New York Botanical Garden has been given by soil sterilization with dip dust and formaldehyde. The application of uspulun to some badly rotted rhizomes (after the excision of the diseased parts), coupled with replanting in fresh soil, also gave beneficial results.

Irises in the test plantings at the propagating gardens suffered severely from bacterial soft rot (*Bacillus carotovorus*) [loc. cit.] during the spring and summer of 1929. Inoculation experiments with the causal organism, isolated from diseased plants, gave positive results in every case where the inoculum was inserted through punctures, but not when it was simply smeared on the surface of the plants. Spraying the plants with a bacterial suspension in sterile water resulted in the development of infection, but only after considerable delay; there is also a possibility that the leaves of these plants may not have been entirely free from

injury. The fact that infection may result from contact, however established, between the bacteria and the leaves, should be taken into account in dealing with the disease. The inoculation of the roots, both through punctures and by spraying with bacterial suspensions, caused typical rotting, indicating that infection may well occur through roots and rootlets in the process of replanting and cultivation. The bacteria, however, are apparently unable to penetrate the unwounded root hairs and epidermis of sound fleshy roots.

The strain of *B. carotovorus* used in these experiments bore out Richardson's observation as to the tendency of the organism to lose its infective capacity after several months in culture [ibid., iii, p. 137].

Control measures against bacterial soft rot should include soil sterilization with formaldehyde or some other standard disinfectant and the replacement of badly infested by healthy soil. Good results have been reported from the application of semesan dust to the base and heart of the plants, while the treatment of the soil with mercuric compounds, and of diseased rhizomes with sulphur or a solution of potassium permanganate are also recommended. Certain desirable cultural practices are briefly indicated.

A severe case of seedling damping-off caused by *Rhizoctonia* [*Corticium*] *solani* (not hitherto recorded on the iris) was controlled by spraying the soil and young plants with uspulun.

WILSON (M.). **The rust disease of Berberis (Mahonia) aquifolium.**—*Gard. Chron.*, lxxxvii, 2251, pp. 132–133, 2 figs., 1930.

A brief description is given of *Puccinia mirabilissima*, which was first recorded outside America in 1922, when it was found on *Berberis* (*Mahonia*) *aquifolium* near Edinburgh. Since then the rust has been observed in various parts of central and southern Scotland, Denmark [*R.A.M.*, vii, p. 223], northern Holland, and north-western Germany.

A few teleutospores usually occur among the uredospores on the older leaves. It is probable that the uredo- as well as the teleutospores survive the winter; the latter readily germinate in the spring, when each cell may give rise to two germ-tubes from the laterally situated germ-pores. During the past three years an aecidial form believed to belong to this rust has also been found on infected plants in several places.

The author thinks it possible that the fungus may have been introduced into Europe on some of the newly developed American varieties of *B. aquifolium* or on the supposed hybrids between this variety and *B. repens*, or it may have travelled on dead fragments of its host in contact with other species which have been imported during the last twenty years into Scotland from the United States. There is some reason to suppose that *P. mirabilissima* was carried from Scotland to Denmark, and from the latter country to north-western Germany, where the affected plants were obtained from near the Danish border. [A similar account of the fungus and its distribution is given by the author in *Ann. Mycol.*, xxviii, pp. 225–229, 1930.]

Pape (H.). **Die Myrtenschütte.** [Leaf fall of Myrtles.]—*Gartenwelt*, xxxiv, 13, pp. 174–175, 3 figs., 1930.

Myrtle [*Myrtus communis*] plants in German nurseries are stated to be very subject to infection by *Cercospora myrti*, which causes a purple to dark brownish-red spotting of the leaves and ultimate defoliation. The spots on the under side of the leaves are covered with a fine, dark grey down, consisting of short conidiophores emerging from the stomata and bearing the long, curved spores of the fungus [a figure of which is given]. Affected plants should be sprayed with 0·5 to 1 per cent. Bordeaux mixture or some other standard copper-containing preparation, the beneficial action of which is rapidly apparent. Cultural measures should include absence of shade and free circulation of the air, as well as the removal of all infected material.

Weimer (J. L.). **Temperature and soil-moisture relations of Fusarium oxysporum var. medicaginis.**—*Journ. Agric. Res.*, xl, 2, pp. 97–103, 4 graphs, 1930.

The results of experiments [details of which are given] in 1926 to 1928 showed that the optimum temperature for growth in pure culture of the lucerne wilt fungus (*Fusarium oxysporum* var. *medicaginis* [*R.A.M.*, ix, p. 188] is near 25° and the maximum about 37° or 38° C. The minimum was not determined, but it appears to lie below 3°. In inoculation experiments with the Kansas Common variety of lucerne under controlled temperature and soil moisture conditions, it was found that the optimum temperature for infection agrees with that for growth in pure culture; considerable infection also resulted at 17°, the lowest temperature tested, and the disease developed, although poorly, at 35°. Infection occurred earlier and developed better with a soil moisture of 55 than of 35 per cent. of the water-holding capacity; the former was also more favourable for the growth of the host. The Grimm and Hairy Peruvian varieties proved to be susceptible, Grimm slightly more so than the other.

These results indicate that the wilt fungus is capable of infecting lucerne over so wide a range of temperature that this cannot be a factor in limiting the distribution of the organism in the United States.

Fischer (G. W.). **A study of the fruit diseases occurring in a Mid-Western market.**—*Butler Univ. Bot. Studies*, Indianapolis, Indiana, i, 8, pp. 105–127, 3 pl., 1930.

Of the 22 different kinds of fruits inspected in the Evanstan (Illinois) markets during the period from October, 1928, to March, 1929, none was free from fungal injury and some were infected by eight or ten species. The fungi found represented 27 genera and 35 species.

Four new records are considered to be of special interest, viz. *Botrytis cinerea* producing a rapid, soft, brown rot of quinces; *Monilia sitophila* [*R.A.M.*, viii, p. 785] causing a soft, transparent decay of honeydew and cassaba melons; *Cephalothecium roseum* responsible for a soft, relatively dry decay of honeydew melons; and *Alternaria mali* producing a soft, brown rot of grapes.

Most of the other diseases are well known. *Oospora citri-aurantii* [ibid., vii, p. 163] was commonly found on grapefruit and oranges, causing severe damage especially to the former host; the diseased fruit was rendered not only worthless but obnoxious owing to the repulsive odour accompanying the later stages of decay. Kumquats (*Fortunella marquarita*) were affected by a dark internal rotting believed to be due to *A. citri*.

Greening apples were invaded by *Mucor griseo-lilacinus*, the cause of a rapid, soft, brown rot.

Two or three undetermined species of *Penicillium*, evidently of some importance, were isolated from diseased cranberries. The most common fungus affecting this fruit was a dark grey, profusely growing organism believed to be possibly *Helminthosporium inaequalis*.

JEHLE (R. A.). **Problems in the control of Apple scab.**—*Trans. Peninsular Hort. Soc.* (*1929*), xix, 3, pp. 27–30, 1929.

From 1926 to 1929 the maximum ascospore discharge of *Venturia inaequalis* on apple leaves occurred before the pink bud stage in the Eastern Shore region of Maryland, this being noted in the Western Shore region also in two of these years. In 1927 and 1929, when the maximum ascospore discharge occurred while the trees were in bloom in western Maryland, a few warm days developed the fruit buds so rapidly that orchards not sprayed earlier than the pink bud stage could not be covered before they were in bloom. The variation in the periods of ascospore discharge in relation to the stage of development of the host is due to the fact that the fungus develops most rapidly at about 40° to 65° F., whereas apple trees develop most rapidly at higher temperatures. Experience indicates that as a rule it is unsafe for Maryland growers to wait until the pink bud stage before making their second spray application; in some years the application given at the delayed dormant stage may be the most important for the control of *V. inaequalis*, as it usually protects the trees from the earliest ripening spores. Oil sprays not containing a fungicide may have to be followed, when used in the dormant stage of the trees, by an application at the delayed dormant stage or rather later of summer strength lime-sulphur, which is the most satisfactory of the fungicides hitherto tested by the author.

VOGLINO (P.). **Le macchie ocracee del Melo. (Phyllosticta briardi Sacc.)** [The ochraceous spots of Apple. (*Phyllosticta briardi* Sacc.).]—*La Difesa delle Piante*, vii, i, pp. 1–3, 1930.

In the late summer and autumn in 1929, old, neglected apple trees in the vicinity of Susa, north-west Italy, developed a leaf withering characterized by circular, nearly black spots which bore the pycnidia of *Phyllosticta prunicola*, containing ovate-ellipsoidal pycnospores with pointed apices; and also by dry, elliptical, ochraceous, confluent spots bearing the aggregated, spheroidal pycnidia of *P. briardi*, 80 to 110 μ in diameter. The bacillary, cylindrical, hyaline pycnospores of the latter were truncated at the apex and measured 4 to 5 by 1·5 to 2 μ. Inoculations of healthy

apple plants with pure cultures of this fungus gave positive results.

P. briardi is not considered to be dangerous as a rule, though it may, especially on late varieties, interfere with the ripening of the fruit and the maturation of the twigs. The usual spring and summer applications of oxychloride of copper or 1 per cent. Bordeaux mixture should be beneficial.

KIDD (F.) & WEST (C.). **The gas storage of fruit. II. Optimum temperatures and atmospheres.**—*Journ. Pomol. and Hort. Science*, viii, 1, pp. 67–77, 1 diag., 1 graph, 1930.

The investigation reported in detail in this paper was made in continuation of the authors' study of the effects of storing apples in atmospheres of regulated composition [*R.A.M.*, vi, p. 622] to ascertain the interaction of the three variable factors (1) temperature, (2) concentration of carbon dioxide, and (3) concentration of oxygen. The trials, in which Bramley's Seedlings were used, lasted from 23rd October, 1926, to 22nd June, 1927, under three temperatures, namely, 1°, 5°, and 10° C., and ten different atmospheres at each temperature, namely: 5 and 10 per cent. oxygen each combined with 0, 5, 10, and 15 per cent. carbon dioxide, 15 per cent. oxygen with 15 per cent. carbon dioxide, and ordinary air.

The results showed that at the temperature of 1° the wastage was entirely due to the development of internal breakdown in the green, unripe fruit, the first signs of which occurred in February. At 5° and 10° the wastage was entirely caused by fungal rotting, which was first observed in the air-stored control at 10° in January. Scald developed in certain cases late in the storage life of the fruit, when wastage from internal breakdown and fungal rots had exceeded 10 per cent. The results also indicated that at 1°, the controlled atmospheres were in all cases less efficient than air in prolonging the commercial storage life of the apples (defined as the interval of time between the date when the fruit is stored and the development of 10 per cent. wastage). At 5° (which is above the limit for low temperature internal breakdown) and at 10° the controlled artificial atmospheres were in all cases more efficient than air, the degree of efficiency shown by any given concentration of carbon dioxide being dependent both on temperature and oxygen concentration.

From a practical point of view, the most efficient combination is a temperature of 5° with an atmosphere containing 10 to 15 per cent. of carbon dioxide and about 10 per cent. oxygen. This combination gives 1·5 times better results than the best results obtained by the use of cold storage alone. The practical significance of the fact that at 1° all the artificial atmospheres tested were less efficient than air, is that under present conditions of commercial practice carbon dioxide often accumulates in refrigerated fruit stores and in the holds of ships carrying apples.

The paper terminates with a consideration of the effects of the conditions tested upon the change of ground colour of the apples from green to yellow, and upon the chemical changes which take place in the fruit.

TROUT (S. A.). **Experiments on the storage of Pears in artificial atmospheres.**—*Journ. Pomol. and Hort. Science*, viii, 1, pp 78–91, 1 graph, 1930.

A description is given of storage experiments in artificial atmospheres which were made with the Conference and Beurre Clairgeau varieties of pears (the second of which is very susceptible to deep scald in cold storage). The results indicate that, by excluding oxygen from the atmosphere, the storage life of the pears may be prolonged to the extent of 50 per cent. of the normal for any temperature, provided the latter is not too high and an accumulation of over 10 per cent. carbon dioxide is avoided. This treatment was also found to conduce to normal ripening instead of premature scalding or breakdown.

It is considered that the cessation of normal respiratory oxidations in the fruits consequent on the exclusion of oxygen sets up conditions in which the carbohydrate metabolism leads to the accumulation of acetaldehyde in the tissue, associated with scald and core breakdown [*R.A.M.*, ix, p. 254]. The evidence suggests that the sequence of phenomena inside the fruit is more likely to be breakdown followed by waterlogging of the tissue, which sets up anaerobic conditions with accumulation of carbon dioxide leading to formation of aldehyde, rather than toxic action of the aldehyde formation leading to breakdown and waterlogging.

ADAMS (J. F.). **Some recent studies on the problem of bacterial spot of Peach.**—*Trans. Peninsular Hort. Soc.* (*1929*), xix, 3, pp. 33–38, 1929.

Tests made during 1927 and 1928 with Elberta peach trees to ascertain whether overwintered diseased leaves were a source of spring infection by bacterial spot (*Bacterium pruni*) [*R.A.M.*, viii, p. 727] gave negative results. In September, 1927, 138 seedlings were budded with buds selected from Elberta peach trees defoliated during the summer as a result of attacks by *Bact. pruni*, and 17 were planted during February, 1928, in a greenhouse, together with 12 other Elberta trees budded in the ordinary way. The last-named developed perfectly, but only 8 of the 17 seedlings with the diseased buds developed. The remaining 121 budded seedlings were planted in the open with 24 regularly budded Elberta and Hale seedlings; only 26 out of the former lot developed, as compared with 20 in the latter.

In September, 1928, a large number of cankers on the new growth were marked; by the middle of November 10 per cent. of the twigs with the marked cankers had died. Isolations from fifteen of the cankers on dead twigs and five from living twigs gave *Bact. pruni* in 33 and 50 per cent. of the plates, respectively. Cankers on living wood collected in October and November, 1928, and January, March, and May, 1929, yielded *Bact. pruni*.

Histological studies indicated that cankers were active in twigs collected on 3rd October, but remained dormant after this date until 12th May.

The importance of cankers in the overwintering of the disease was illustrated in a planting of the Hale variety where fruit infection had been exceptionally severe. Half the trees were dehorned

(severely cut back) and during the following two years the foliage on the new growth showed almost no infection. After the originally dehorned trees were back in bearing, the other half were dehorned. When the entire planting was again bearing the amount of fruit infection was only 12 per cent.

Toxicity studies demonstrated that zinc sulphate prevented the growth of the bacteria in dilutions up to 1 in 2,500, zinc sulphate and hydrated lime (4–4–50) up to approximately 1 in 1,200, hydrated lime (15 lb. per 50 galls. water) up to 1 in 700, while 2 per cent. ethyl mercury chloride prevented growth in dilutions up to 1 in 10,000.

Spraying tests [the results of which are tabulated] made with sprays applied in addition to the standard schedule for peach spraying, on Elberta trees severely affected for three years, showed that the best results (estimated by the amount of fruit infection on trees given the double treatment and those given schedule treatment only) were given by ethyl mercury chloride and by zinc sulphate with hydrated lime. Further tests are necessary to determine whether autumn and spring dormant applications give as good control of fruit infection as do applications made in April and May.

Long (C. L.). **Peach leaf curl.**—*Better Fruit*, xxiv, 7, pp. 14, 24, 1930.

A brief account is given in popular terms of the symptoms, mode of infection, and control of peach leaf curl [*Taphrina deformans*], which is stated to be the most serious disease of peaches in the north-western areas of the United States. It is much more prevalent and destructive west of the Cascade mountains than east of this range. The Elberta, J. H. Hale, and some of the cling varieties are susceptible, and Crawford less so, while the Muir and Salwayo varieties are probably as resistant as any grown in these localities, though varietal susceptibility appears to vary with the weather. The best control is given by thorough dormant spraying annually as soon as possible after 1st December and not later than 1st February; Bordeaux mixture 6–6–50 is the most suitable spray in the cool, wet spring of Oregon, while dormant lime-sulphur gives satisfactory results in the sunnier areas east of the Cascades.

Zeller (S. M.). **Yellow rust and cane blight of Red Raspberry in Oregon.**—*Better Fruit*, xxiv, 7, pp. 5–6, 2 figs., 1930.

An account is given in popular terms of yellow rust of raspberries (*Phragmidium imitans*) [*R.A.M.*, vi, p. 676] which is present throughout Oregon and is important not only for the direct damage which it causes but also for the other infections which take place through the rust spots. The chief of these secondary infections is cane blight (*Leptosphaeria coniothyrium*) [ibid., i, p. 297; ix, p. 117], which attacks all the important varieties of raspberries, especially Cumberland black and Cuthbert red, and prevails in all the chief raspberry-growing areas in Canada and the United States. Infection takes place by this means in the

most propitious place for the fungus, i.e., near the base of the green canes. The small oval cankers caused by *P. imitans* are enlarged by the blight into long ones on the side of the cane, and these usually become sunken and often split open on the second-year fruiting canes. The canes become very weak at these places, the presence of two cankers sometimes proving fatal. In some localities over 40 per cent. of the canes have been destroyed by this combination of diseases. Control consists in taking stringent sanitary precautions to remove as many sources of rust infection as possible.

NOJIMA (T.). **Studies on two different species of Pestalozzia parasitic on the leaves of Diospyros kaki L.**—*Bull. Kagosima Imper. Coll. Agric. & Forestry, 1929*, 7, 34 pp., 1 pl., 5 figs., 1929. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 1, pp. (16)–(17), 1930.]

Persimmon (*Diospyros kaki*) is stated to suffer from premature leaf fall due to infection by *Pestalozzia diospyri* Syd. and *P. theae* Sawada [*R.A.M.*, viii, p. 814], which may be differentiated by the shape and size of the lesions, spore shape, cultural characters, &c. On dry apricot solution, bodies apparently corresponding to pseudopycnidia are formed. Both fungi grow at a range of 10° to 40° C., the optimum range for *P. diospyri* being 16° to 32° and for *P. theae* 24° to 32°. The spores of *P. diospyri* can survive for 30 minutes at a temperature of 45°, but die after 20 minutes at 55°.

PAILLOT (A.). **Traitement d'hiver des arbres fruitiers par les émulsions d'huile minérale en bouillie cuprique.** [Winter treatment of fruit trees by emulsions of mineral oil in copper mixture.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 5, pp. 181–183, 1930.

The writer recapitulates his formula for the preparation of a combined fungicide and insecticide (Bordeaux mixture and anthracene oil) for the winter treatment of fruit trees [*R.A.M.*, iii, p. 288]. Objections have been raised to the use of this mixture on the grounds that it is difficult to prepare, and directions are accordingly given for the further simplification of the process, an essential feature of which is the employment of very pure lime, preferably one of the superior brands of flowers of lime now on the market. The mixture costs only Fr. 25 per 100 l.

FISHER (H. J.) & BAILEY (E. M.). **The composition of some commercial insecticides, fungicides, bactericides, rodenticides and weed killers. A compilation.**—*Fifty-second Rept. Connecticut Agric. Exper. Stat. for the year 1928* (*Bull.* 300), pp. 207–368, 1929. [Received April, 1930.]

This useful compilation gives details of the composition of a large number of commercial disinfectants, including some standard fungicides, the names and addresses of the manufacturers being furnished in each case and the bibliographical sources of information listed [cf. *R.A.M.*, ix, p. 325].

Robinson (R. H.). **Sprays, their preparation and use.**—*Oregon Agric. Exper. Stat. Bull.* 259, 27 pp., 1 diag., 1930.

Directions are given for the preparation, by approved methods, of a number of standard fungicides and insecticides, together with some general information regarding the physical and chemical properties of the different commercial products. By means of a 'compatibility chart' the compounds which may and may not be safely mixed in the spray tank are indicated.

Hoerner (G. R.). **Dusting in the Northwest.**—*Better Fruit*, xxiv, 8, pp. 9–10, 1930.

Since 1928 numerous hand and power dusting appliances have been brought into service against diseases of fruit trees in Oregon with highly satisfactory results. While not put forward as a panacea, dusting, provided the same attention to details is given as when liquid sprays are used, has emphatically proved to be an effective and economical practice in plant disease control.

In the coastal areas of Oregon heavy losses have resulted from the defoliation of clover caused by mildew [*Erysiphe polygoni*], badly diseased fields presenting the usual 'talcum powdered' appearance; sulphur dust applied at the rate of not more than 25 lb. per acre gave satisfactory control. In the same State the chief dusting problems as regards apples and pears are concerned with apple scab [*Venturia inaequalis*] and mildew [*Podosphaera leucotricha*], but both are controllable by timely dusting. Plums are affected by brown rot [*Sclerotinia cinerea* f. *pruni* or *S. americana*: *R.A.M.*, viii, p. 253], but sulphur dusting has given such satisfactory control that it has become a regular orchard practice.

Goodwin (W.), Martin (H.), & Salmon (E. S.). **Polysulphide sulphur in relation to the fungicidal efficiency of certain spray materials.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 127–136, 1930.

The authors state that comparative experiments [brief details of which are given] on the fungicidal efficacy of a commercial lime sulphur, 'amberene' (a commercial solution of sodium polysulphides), and solutions of sodium, potassium, barium, and calcium polysulphides prepared in the laboratory, as measured by their lethal action on the hop powdery mildew (*Sphaerotheca humuli*), showed that their efficacy was directly related to their content in polysulphide. Spray fluids containing from 0·107 to 0·114 gm. polysulphide sulphur per 100 c.c. were entirely or very nearly fungicidal, but those at lower concentrations were not. These results are in agreement with, and confirm the indications of, previous work described in a series of papers on the fungicidal properties of certain spray fluids [*R.A.M.*, v, p. 566], which is briefly reviewed and co-ordinated in this note. It is concluded, therefore, that the estimation of the amount of polysulphide sulphur present in lime-sulphur spray fluids provides a measure of the efficiency of these materials against *S. humuli*.

YAMADA (W.). **On the fungicidal action of lime-sulphur mixture.** —*Ann. Phytopath. Soc. Japan*, ii, 3, pp. 297–298, 1930.

The best results in the destruction of *Diaporthe nomurai* Hara (conidial stage *Phomopsis*), a parasite of mulberries at the Niigata (Japan) Prefectural Mulberry Experiment Station, were obtained in laboratory experiments during 1927–8 by 5 minutes' to 24 hours' immersion in 1 in 30 lime-sulphur (0·5° to 5° Beaumé). In another test, in which conidial germination was tested by the drop culture method with concave slides, each bearing a different solution (1 in 5 to 1 in 24.000) of 27° B. lime-sulphur allowed to dry on the slide in the laboratory, the conidia were all dead at 1 in 1,500 and nearly all at 1 in 3,000, but germination occurred at 1 in 6,000 to 24,000. Germination took place in Bordeaux mixture (4–4–50 or 6–6–50), but all the conidia were dead in 0·01 per cent. formalin, 50 per cent. alcohol (kept wet), or under 0·4 per cent. sulphur water droppings. Conidial germination was inhibited by lime-sulphur on concave slides exposed in the laboratory for two years, and under 1 per cent. sulphur suspension in water for 43 days. The efficacy of lime-sulphur as a fungicide depends on humidity and a high temperature.

N[ARASIMHAN] (M. J.). **Linseed oil as an adhesive for Bordeaux mixture.**—*Trop. Agriculturist*, lxxiv, 2, p. 115, 1930.

The author states that laboratory tests and a small range of field experiments showed that linseed oil added to 5–5–25 Bordeaux mixture at the rate of 10, 20, or 40 oz. per 25 gallons of the mixture, is a very effective spreader both on glass plates and when sprayed on coffee bushes and areca palms. When compared on the latter with Bordeaux mixture containing casein [*R.A.M.*, vii, p. 442], it was found that the linseed oil Bordeaux mixture was not so easily washed off. It is pointed out that the quantity of linseed oil to be added should be based on the quantity of copper sulphate and lime used.

IDETA (A.). **A brief history of plant pathology in Japan.**—*Ann. Phytopath. Soc. Japan*, ii, 3, pp. 197–206, 1930.

An outline is given of the development of phytopathology in Japan from its inception about 1876, when the Sapporo Agricultural College was founded in Hokkaido, to the present day. Notes are given on the various scientific journals publishing phytopathological articles, together with a list of 33 important works on phytopathological subjects which have appeared in Japan since 1882. Some outstanding achievements of Japanese phytopathologists are concisely summarized, and the principal agricultural experiment stations with phytopathological laboratories are enumerated.

SHEFFIELD (F. M. L.) & SMITH (J. H.). **Intracellular bodies in plant virus diseases.**—*Nature*, cxxv, 3145, p. 200, 1930.

Fresh light has been thrown on the formation and nature of the cell inclusions associated with certain virus diseases by a study of the bodies occurring in *Solanum nodiflorum* infected by the yellow or aucuba mosaic of the tomato [*R.A.M.*, ix, p. 417].

It has been found possible to follow, in the individual living cell, the development of the X-body from inception to completion. This may be effected by inoculating a young plant, detaching a suitable leaf at the first sign of disease, and subjecting to consecutive microscopic examination the hairs projecting from its margin. The leaf is then placed with its petiole in water or nutrient solution and re-examined at short intervals; the appearance and development of the X-bodies can be watched in selected individual hairs for many days.

In the early stages of infection the streaming cytoplasm of the hair cells is found to contain small particles, which tend to aggregate and form larger masses. The minute particles are checked at the anastomoses of the cytoplasmic strands, the interruption lasting for as long as two hours, when the bodies have reached a considerable size. During such a halt the stationary particle may be joined by another one, until by successive increments large masses are eventually formed which are readily recognizable as X-bodies. The composite masses may remain permanently united, fusing together into a homogeneous structure in which vacuolation may be observed; or they may separate into their constituent parts which again resume independent movement. In the latter case a process of fission may be simulated, but the separate portions may reunite. Similarly, when a smaller mass breaks away from, or joins up with, a larger one, pseudopodia may be simulated. In leaves which have been infected for several weeks, the breaking down of the bodies is comparatively common.

This mode of formation is held by the writers to account for many of the appearances leading to the belief in the animate nature of the X-bodies [ibid., viii, p. 611]. It further explains the marked tendency of these structures to be associated in position with the nucleus, around which the protoplasmic strands of the cell cross and anastomose most freely. The minute particles give the impression of being foci in which the protoplasm has condensed or solidified, and are of no fixed shape. There is no sign of autonomous movement or any suggestion of life in the sense of an independent organism or parasite. The theory that the X-bodies are cytoplasmic condensations is supported by their protein nature. They give the usual protein reactions and are soluble in acid and alkali of sufficient strength, insoluble on boiling and in alcohol. They show a distinct tendency to crystallize out, especially in old leaves, and the crystals have all the characters of protein crystals, such as are seen in the aleurone grains. In polarized light these crystals do not appear, nor does the uncrystallized body, though sometimes one or two small doubly-refracting crystals may be seen lying on the surface of the body or embedded in its substance.

[A more detailed account of these observations is published by J. H. Smith in *Ann. Appl. Biol.*, xvii, 2, pp. 213–222, 4 pl., 1 fig., 1930.]

Smith (J. H.). **Virus diseases in plants. I. Translocation within the plant. II. The amoeboid intracellular inclusions.** —*Biol. Reviews*, v, 2, pp. 159–170, 1930.

The writer summarizes and briefly discusses some of the more

important contemporary literature on two aspects of the virus diseases of plants, namely, the translocation of the infective principle within the host, and the amoeboid intracellular inclusions. With regard to the former, it is concluded that transport is probably effected mainly by the phloem, the rate of spread being apparently too high for movement from cell to cell, and too low for conveyance by the water stream. Respecting the intracellular inclusions, the author inclines to the view (supported by his recent investigations) [see preceding abstract] that these bodies are not living organisms, but reaction-products of the host cells to the virus irritant.

Olitsky (P. K.) & Hoffman (D. C.). **The electric charge of mosaic virus particles.**—*Proc. Soc. Exper. Biol. & Med.*, xxvii, 5, pp. 378–379, 1930.

A study was made of tomato mosaic with the objects of noting (*a*) the possible migration of a plant virus in an electrical field, (*b*) the direction of migration, and (*c*) any difference of behaviour of unfiltered and filtered suspensions.

The method of cataphoresis employed has already been described (*Journ. Exper. Med.*, 1, p. 263, 1929). Tests were made at 4 milliampères, 118–119 volts P.D., over a three-hour period. Suspensions of ground mosaic-infected leaves were prepared in G.P.A. [glycerine, sodium phosphate, and sodium acetate] (*Journ. Gen. Physiol.*, iv, p. 642, 1922), or in phosphate buffer solutions at P_H 5·3 to 8·5, with final dilutions of 1:300 to 500. Filtrates were obtained by single filtration through Berkefeld 'N' candles. The anodic and cathodic materials were inoculated, respectively, into each of five to ten normal tomato plants.

The results [which are tabulated] show that the mosaic virus or particles containing it migrate to the anode in an electrical field at P_H readings of 5·3 to 8·5, the tomato virus therefore agreeing in this respect with most viruses of mammalian origin and with bacteriophage. The qualitative results were equally definite in filtered and unfiltered suspensions, the quantitative differences in the former being probably due to the well-known factor of diminution of infective capacity after filtration of the mosaic virus. In a control test of filtrate inoculations, only three out of ten plants showed mosaic after eleven days. A greenish clouding, resulting from protein and chlorophyll deposits, occurred at the anode only in both filtered and unfiltered suspensions at hydrogen-ion concentrations of P_H 7·0 to 8·5.

Kelly (A. P.). **Mycorrhizal studies. I. Mycorrhiza of Mont Alto nursery stock.**—*Journ. of Forestry*, xxviii, 1, pp. 34–41, 2 figs., 1930.

A description is given of the mycorrhiza of a number of forest tree seedlings in the Mont Alto State Nursery, Pennsylvania.

The mycorrhiza of *Pinus strobus*, *P. resinosa* (in part), and *Larix kaempferi* (in part) may be classed as ectotrophic, while those of *Picea abies*, *Pinus rigida*, *P. echinata*, *P. sylvestris*, *Juglans nigra*, and *Fraxinus americana* belong to the ectendotrophic group [*R.A.M.*, vi, p. 680]. *F. americana* was provided

with a sparse external fungous mantle which did not prevent the formation of occasional root hairs, and yellow masses of bodies similar to arbuscles [ibid., ii, p. 172; iii, p. 290; iv, p. 301] occurred in the cortex and xylem parenchyma, while other cells also contained masses like *corps jaunes*. These yellow bodies resembled those described by Miss McLennan as fat globules in old roots of *Lolium temulentum* [ibid., v, p. 379] but did not stain with osmic acid or fuchsin-iodine green. It is thought that they may possibly be chitinized hyphae.

Two yellow zones were detected in transverse sections of *Picea abies* roots as a result of infection of the outer cortex and pericycle. Some cells were occupied by arbuscles and others by remnants of sporangioles. In *Pinus rigida* infection of the central cylinder occurred and yellow masses were contained in the phloem and young xylem cells. The cortex and pericycle of *P. sylvestris* were densely infected, the older roots showing indications of a Hartig net [ibid., iv, p. 430] and infection of the central cylinder. The Hartig net is better developed in *P. echinata*, the central cylinder of which is also heavily infected, while 'Verdauungszellen' (the term applied by Magnus to infected cortical cells in which the hyphae undergo rapid degeneration) appear very well developed. The entire cortical area of *P. resinosa* is occupied by a dense Hartig net. The pericycle becomes filled with a dense yellow substance, while the rest of the central cylinder is free from infection. A dense fungal mantle was also observed. Neither in this species nor in *L. kaempferi* is the mycorrhiza truly ectotrophic, for intracellular mycelium is present. In *Larix* the cortex, pericycle, and xylem were heavily charged with a granular substance. In old roots the pericycle cells were transformed into 'Verdauungszellen', while in one case the cortical cell walls had broken down, revealing a series of brown, spore-like bodies enclosed by a thin cork. *Larix* growing in clay was more nearly ectotrophic, but the cortical cells were penetrated by short, thick haustoria. In *P. strobus* there was a firm Hartig net with scanty intracellular infection in the form of an intricately wound hyphal skein. The central cylinder was infected. Starch was present in large quantities.

Smith (A. H.). **Fruit-tree mycorrhiza around Ann Arbor, Michigan.**—*Papers Michigan Acad. of Science, Arts and Letters, 1929*, xi, pp. 243–248, 7 pl., 1930.

During the early winter of 1928 an investigation was conducted at Ann Arbor, Michigan, to ascertain to what extent mycorrhiza were present on the roots of fruit trees (apple, pear, plum, cherry, and peach) in orchards of different types. The soils were as follows: sandy, cultivated, well drained; clayey, cultivated, poorly drained; well drained sod land; humus soil; and a hill overgrown with locust [*Robinia pseud-acacia*].

Endotrophic mycorrhiza of the type with vesicles and arbuscles were found on all the trees, but ectotrophic mycorrhiza were absent. As a rule, the infected rootlets had the typical beaded appearance, but often they appeared to be perfectly normal. Most of the mycorrhiza in the cultivated soils, where the surface

roots had been destroyed by ploughing, were found at a depth of 6 or 8 in. In the sandy areas they were sometimes found down to 10 in. In places where the roots had not been affected by ploughing, mycorrhiza were found on the rootlets nearest the surface as well as lower down. On the hill they were found on the upper 3 in. of the soil, and in the humus-rich soil they were always present in the humus, but few were found in the underlying soil. In the cultivated sandy loam, humus, and sod land they were very abundant, but in the clayey soil, which was very wet, and on the hill, which was very dry, they were scarce. Both the last-named situations contained relatively small amounts of organic matter.

Kusano (S.). **The life-history and physiology of Synchytrium fulgens Schroet., with special reference to its sexuality.**—*Japanese Journ. of Botany*, v, 1, pp. 35–132, 17 figs., 2 graphs, 1930.

A very detailed account is given of the life-history and physiology of *Synchytrium fulgens*, a parasite of *Oenothera lamarckiana* and *O. biennis*, with special reference to its sexual relations.

Sexual reproduction has been shown to occur, the zoospores being actually planogametes. The zygote derived from two copulated gametes develops into the resting cell, while a single gamete is able to develop parthenogenetically into the summer gametangium. On germination the resting cell produces the winter gametangium sorus, which is of exogenous origin (i. e., it is produced outside the vegetative fungus body), while the summer gametangium sorus is endogenous, developing directly out of the fungus body.

The planogametes are all morphologically similar and piriform while swimming, and the fungus is monoecious. There is no difference in form or function between the gametes originating in the resting cell and those derived from the summer sorus.

Resting cells can germinate without overwintering, but stored under air-dry conditions were found to retain their viability for seven years, while those kept in water may remain dormant for half this period. The viability of the gametangia from both summer and winter sori is maintained for over three months at low temperatures and in the presence of sufficient humidity to prevent desiccation.

Kusano (S.). **Resistance of Oenothera to the attack of Synchytrium fulgens.**—*Journ. Coll. of Agric., Imper. Univ. Tokyo*, x, 4, pp. 313–327, 1 pl., 2 figs., 1929.

After stating that *Oenothera odorata* and *O. sinuata* remain healthy in Japan when grown in close proximity to *O. lamarckiana* and *O. biennis* severely infected by *Synchytrium fulgens* [see preceding abstract], the author gives a full account of his inoculation experiments and cytological studies on the nature of the resistance shown by the two former species.

In pot inoculations with the summer gametangia of *S. fulgens* on *O. odorata*, *O. lamarckiana*, and *O. biennis*, the two last-named became severely infected, but it was not until later that *O. odorata* showed even very slight spotting; the fungus developed normally at first, and multiplication of the surrounding cells took place as in

the susceptible hosts. The mature sorus, however, was incapable of dehiscence, and turned brown inside the host cell. From these results it is concluded that *O. odorata* is not completely resistant to *S. fulgens* but that the mechanical obstacles offered by the thick, tough leaves and the strong epidermis prevent the dehiscence and the dispersal of the gametangia.

When *O. odorata* was grown under moist conditions, the leaves were tender and hygrophyllous and inoculations resulted in a higher percentage of infection than in the previous experiment, due, no doubt, to the weaker wall of the epidermal cells under these conditions. When tender seedlings of *O. odorata* were grown in a Petri dish and inoculated with recently matured gametangia, the resulting infection of the cotyledons and hypocotyls was as profuse as on similarly inoculated seedlings of *O. lamarckiana* and *O. biennis* raised in the same dish. Other experiments [which are described] confirmed the conclusion that the protoplast of the epidermal cell in the aerial vegetative organs of *O. odorata* is quite suitable for the development of *S. fulgens*, but that the strong outer wall of the cell greatly impedes the attack of the fungus under ordinary field conditions.

The epidermal wall of *O. sinuata* is thin and offers no mechanical obstruction to infection. When the gametangia of *S. fulgens* were germinated on young shoots, very numerous encysted gametes and zygotes were found on the outer surface of the epidermal cells, and in some cases the round bodies of the fungus were found embedded in the cytoplasm within the cell. For the first two or three days infection appears to proceed normally, but five days after inoculation the fungus bodies were degenerating. It was thus evident that the fungus was able to penetrate the epidermal cell of *O. sinuata* but that its parasitic development was prevented and disorganization followed. When the gametangia were applied to young shoots of *O. sinuata* and covered for a day or two with water soaked cotton fibres, the surface of the stems and leaves turned brown in two to three days, while similarly treated but not inoculated shoots showed no discoloration, nor was this phenomenon ever seen by the author on inoculated *O. lamarckiana* or *O. biennis*. The day after inoculation the fungus was found to have entered several epidermal cells in both *O. sinuata* and *O. biennis*, heavy infection having taken place on the discoloured surface of the former. A day later the arrest of development was visible in *O. sinuata*, in the cells of which the sap was generally stained. No further growth occurred after two days, and both fungus and host cell contents disintegrated. The degeneration of the fungus was invariably preceded by the death of the host cell, and is attributed to starvation.

Attempts to infect the roots of the susceptible hosts failed and it is suggested that the epidermal cells of the aerial parts contain some substance which attracts the fungus, but which is absent from the roots.

To ascertain whether the subepidermal tissues of *O. biennis* and *O. lamarckiana* were also subject to infection [cf. *R.A.M.*, viii, p. 580], part of the epidermis of the petiole of these hosts was removed, occasionally with some underlying layers of cells, gametangia of

S. fulgens being applied to the exposed surface. On subsequent examination the fungus was in no case observed within the cells.

The author concludes that in the cell of *Oenothera* there are three important characters which act as controlling factors in establishing the parasitism of *S. fulgens*, viz. (1) the secretion of a substance attractive to the fungus, (2) the penetrability of the cell wall, and (3) the congeniality of the protoplast. The two former determine whether infection takes place or not, and the last determines its degree of development.

RUMP (L.). **Versuche zur Bekämpfung des echten Mehltaus in Spanien.** [Experiments in the control of true mildew in Spain.]—*Nachricht. über Schädlingsbekämpf.*, v, 1, pp. 10–12, 2 figs., 1930.

Excellent control of vine mildew (*Oidium*) [*tuckeri*: *Uncinula necator*] was given at Utiel, Valencia, in 1929 by one application of 1 per cent. solbar in the middle of June [cf. *R.A.M.*, iii, p. 631]. The treated plots were completely healthy, while the remainder were so badly attacked that the grapes were not worth gathering.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 2, pp. 15–16, 1930.

As from 1st February, 1930, potatoes imported into Austria from countries in which wart disease [*Synchytrium endobioticum*] occurs must consist exclusively of selected and original seed. Each consignment must be accompanied by a duly authenticated certificate vouching for compliance with the official requirements. The practice of trading at the frontiers with small quantities of potatoes from wart-infected countries is, with certain exceptions, prohibited.

Importation of Citrus trees into Southern Rhodesia.—*Rhodesia Agric. Journ.*, xxvii, 2, pp. 184–185, 1930.

As from February, 1930, citrus fruit may be imported without restriction into Southern Rhodesia from Northern Rhodesia and Nyasaland if it is the product of these countries. The importation of citrus trees, including parts for propagation, is allowed only under special permit from the Minister of Agriculture; they must be accompanied by an official certificate to the effect that the nursery or plantation from which the trees were taken was inspected not more than three months before the dispatch, and was then free from serious diseases, including canker (*Pseudomonas citri*). The certificate must also state that *P. citri* is not known to have occurred at any time within one hundred miles of the nursery or plantation. Permits will not be issued in respect to provinces of the Union of South Africa other than Cape Colony and Natal. Imported citrus stock must be grown in quarantine with due supervision for at least three years.

IMPERIAL BUREAU OF MYCOLOGY

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HAYES (H. K.). **Inheritance of disease resistance in plants.**—*Amer. Naturalist*, lxiv, 690, pp. 15–36, 1930.

A general survey is given of recent developments in the work of selection for disease resistance in plants.

A knowledge of the genetic characters of disease-producing organisms is considered to be as necessary as of those of the host. Many physiological forms of fungi are distinguishable solely by their manner of reaction on particular hosts, and are dependent on genotypic differences which do not change rapidly, and are as stable as those of higher plants. New physiological forms may be produced by mutation or hybridization.

Resistance and susceptibility are often dependent on a single genetic factor pair. In most studies of reaction to particular physiological forms of stem rust of wheat [*Puccinia graminis*] where the parents reacted reciprocally to two forms, it was found possible to combine resistance to both forms in a single wheat. In many cases, however, multiple factors are involved. Thus it was ascertained by a study of linkage relations that there are three factor pairs concerned with resistance or susceptibility to spot blotch of barley (*Helminthosporium sativum*) [*R.A.M.*, iii, p. 643] and two factor pairs for resistance or susceptibility to maize smut (*Ustilago zeae*) [ibid., ix, p. 237].

VASUDEVA (Mme R. S.). **Studies in the physiology of parasitism. XI. An analysis of the factors underlying specialization of parasitism, with special reference to the fungi Botrytis allii, Munn, and Monilia fructigena, Pers.**—*Ann. of Botany*, xliv, 174, pp. 469–493, 2 graphs, 1930.

An analysis has been made of the factors responsible for the failure of *Monilia* [*Sclerotinia*] *fructigena* to attack onions and for that of *Botrytis allii* to infect apples [*R.A.M.*, viii, p. 591 ; ix, p. 321].

The outstanding feature of *Sclerotinia* spores placed in wounds on onion is their failure to germinate, due to the presence of a thermolabile substance susceptible of extraction with chloroform or ether. On the other hand, the incapacity of *B. allii* to infect apple is not due to any inhibitory or retarding action of the apple

juice on their germination, or to any subsidiary factors such as lack of sufficient oxygen or over-concentration of carbon dioxide within the wound, or to self-staling of the fungus. Evidence was further obtained that *B. allii*, under certain conditions, is able to produce demonstrable quantities of pectinase enzyme which attacks and destroys the apple cell wall substance. *B. allii* can be made to parasitize apple tissue by the addition to the inoculum of a certain concentration of a nitrogenous substance, e. g., asparagin, ammonium salt, potassium nitrate, or peptone. The addition of such substances further increases the rate of attack by *S. fructigena*. The amount of nitrogenous substances required to produce a definite amount of infection decreases with advancing maturity of the fruit, until eventually a stage is reached at which attack occurs when the spores are sown in water only. The effect of a nitrogenous compound in stimulating invasion by the spores of *B. allii* was found to run parallel with its action in promoting the secretion of the pectinase enzyme.

A method of artificially ripening apples by exposure to fairly high temperatures is described. This process further renders the fruit susceptible to infection by *B. allii*.

Van Der Veen (R.). **Onderzoekingen over tracheomykosen.** [Investigations on tracheomycoses.]—Thesis, University of Utrecht (Hollandia-Drukkerij, Baarn), 89 pp., 2 pl., 6 figs., 13 graphs, 1930.

A comprehensive account is given of the author's investigations on the tracheomycoses of plants, especially those of tomatoes and China asters, associated with *Verticillium albo-atrum* [*R.A.M.*, ix, p. 6] and *Fusarium conglutinans* var. *callistephi* [ibid., viii, p. 553], respectively.

The strains of *V. albo-atrum* examined were isolated from tomato, *Syringa*, *Ribes*, *Rhus*, and raspberry. They were found to fall into two groups, one having a black stromatic growth formed of a large number of microsclerotia, and the other (represented by two tomato strains) characterized by black hyphae. The strains comprising the former group develop exclusively on the surface of Richards's medium, whereas those of the latter permeate the entire medium. Both groups formed every possible transition in coloration from very dark to hyaline, and there was no apparent correlation between virulence and the capacity for pigmentation, which only developed in the presence of carbohydrates and a plentiful supply of magnesium, and within a definite range of reaction (P_H 5 to 8). The best sources of nitrogen for the fungus are ammonium ions or asparagin. Nitrate can only serve as a source of nitrogen when there are no ammonium ions in the solution. Cultures with a strongly acid ammonium salt rapidly reach the maximum degree of acidity at which growth is possible, while cultures containing nitrate attain an equilibrium at about P_H 8.

Like *V. albo-atrum*, the species of *Fusarium* belonging to the *Elegans* group which cause wilt diseases, viz. *F. conglutinans* var. *callistephi*, *F. vasinfectum*, and *F. oxysporum*, develop pigment (red in this case) in the presence of carbohydrates and an adequate supply of magnesium, and within a certain range of acidity (P_H 3

to 3·5). These organisms also resemble *V. albo-atrum* in their utilization of nitrogen, except that all the species of *Fusarium* tested were able to assimilate nitrate simultaneously with ammonium. The results of inoculation experiments on asters with *F. callistephi* var. *chinensis* clearly showed the influence of ammonium in accelerating and increasing infection, the incidence of which, as well as that of *V. albo-atrum* on tomatoes, was also greater where the soil was rich in nitrogen. Rosen's hypothesis that the toxic properties of *F. vasinfectum* reside in the nitrites formed by the fungus in the course of development [ibid., vi, p. 293] is considered untenable in the light of the author's tests, which show that neither *Fusarium* spp. nor *V. albo-atrum* produce sufficient nitrites to cause wilting, and moreover, that the nitrites are just as injurious to the fungi as to the hosts. The wilting of the infected plants is attributed to the secretion, by the fungi under discussion, of various unknown substances.

Some of the more important contemporary literature on the subject of the immunization of plants against fungous and bacterial diseases is concisely summarized, and a bibliography of 72 titles is appended.

Das Gupta (S. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. II. On the occurrence of saltation in Cytosporina and Diaporthe.**—*Ann. of Botany*, xliv, 174, pp. 349–384, 2 pl., 4 figs., 4 diags., 1 graph, 1930.

A detailed account is given of saltation in a strain of *Cytosporina ludibunda* originally isolated from diseased Lane's Prince Albert apples [*R.A.M.*, viii, p. 251]. The saltants (more than ten of which were obtained from a single monohyphal parent culture) were derived from pycnospores, from sectoring cultures, or from cultures showing no sign of sectoring. The majority of the saltants were unstable, comprising a number of strains of 'ever-saltating' types [cf. ibid., ix, p. 50], and sometimes showing reversion to parental characters. Nearly all the saltants showing the constant character proved to be infertile.

In course of saltation the *Cytosporina* gave rise to saltants of the *Phomopsis* type (i. e., having 'A' and 'B' spores) and some of these by further saltation produced strains comparable to *Cytosporina* in spore character (only 'B' spores). The majority of the saltants were of the former type, but it was found possible to change the character of sporulation by altering the nutrient medium. In standard medium cultures the 'A' and 'B' spores were usually present as distinct types, in Coons's medium certain strains showed all the transitional stages between these types, while in Richards's the same strains failed to produce 'A' spores.

The saltant strains were compared with some authentic species of *Phomopsis* [which are enumerated], and it was found that the latter showed no sufficiently distinctive characters to differentiate them from the *Cytosporina* saltants.

A description is also given of saltation in monohyphal and monoascospore cultures of a strain of *Diaporthe perniciosa* (DH) obtained from diseased apples [loc. cit.]. The saltants differed mainly in mycelial characters. Some of the monoascospore cultures

produced perithecia and are thus homothallic. The strains of *D. perniciosa* obtained from different sources were found to be distinguished mainly by their capacity to form the perfect and imperfect stages, with regard to which the following gradation was observed: (*a*) perithecia and stromata forming 'A' and 'B' spores; (*b*) perithecia and stromata forming 'A' spores only; (*c*) perithecia only; and (*d*) stromata only, forming 'A' and 'B' spores. In shape and dimensions the pycnospores of *D. perniciosa* resemble those of *Cytosporina*.

PETRI (L.). **Influenza di substrati nutritivi esposti ai raggi ultravioletti sopra lo sviluppo dei funghi.** [The influence of nutritive media exposed to ultra-violet rays upon the development of fungi.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 4, pp. 408–410, 1929.

A vigorous red growth of *Blepharospora* [*Phytophthora*] *cambivora* was obtained on carrot agar sterilized at 120° C. and exposed to ultra-violet radiation; similarly, the growth of *Deuterophoma tracheifila* [*R.A.M.*, p. 522] on boiled, irradiated milk was much more vigorous than that obtained on milk subjected to boiling only.

LAIBACH (F.). **Über die Bedingungen der Perithezienbildung bei den Erysipheen.** [On the conditions of perithecial formation in the Erysiphaceae.]—*Jahrb. wissenschaftl. Bot.*, lxxii, 1, pp. 106–136, 2 figs., 1 diag., 1930.

In connexion with the sudden access of perithecial formation by the oak mildew fungus (*Microsphaera quercina*) in Europe of recent years [*R.A.M.*, viii, p. 411], a phenomenon again observed in the forests of the Taunus and the environs of Frankfurt-am-Main in the autumn of 1929, the author describes and tabulates the results of his study, begun ten years ago, of the conditions governing perithecial formation among the Erysiphaceae in general [cf. ibid., viii, p. 735]. Most of the tests were made with *Erysiphe galeopsidis*, a species closely allied to *E. cichoracearum* [ibid., iv, p. 315], which was inoculated, under controlled conditions, into 35 plants belonging to the Labiateae, some two-thirds being species of *Lamium*. In these experiments evidence was obtained of the existence of biological forms of the fungus, several of which are indicated. *M. quercina* was only included in the tests during the last year.

It is evident from the results of the experiments that perithecial formation is primarily dependent on the genotype of the host. This does not necessarily imply that susceptibility to a given mildew and perithecial formation by this species are always concurrent, since one and the same biological strain (of *E. galeopsidis*) may flourish on a certain host (*Lamium amplexicaule*) without forming perithecia, while on another less susceptible host (*L. maculatum*) it will readily produce its perfect stage. Perithecial formation is further dependent, to a lesser extent, on the condition of the host, especially as regards its water relations, being most in evidence where water is deficient. The influence of external

conditions, such as light, humidity, and temperature, appears to be merely indirect, acting on the fungus solely through the host. Heavy production occurs on the older leaves of plants exposed for a lengthy period to low temperatures, and also on those grown in dry soil and under conditions of low atmospheric humidity. In all these cases the osmotic capacity of the host cells is intensified, and relatively unfavourable conditions for the assimilation of nutriment by the fungus are thereby created.

Abundant perithecial formation was secured in the case of *M. quercina* on *Quercus robur* by the use of a method which had proved very successful with *Lamium*, viz., heavy inoculation with conidia under relatively dry atmospheric conditions.

It is considered very doubtful, in the light of these results, whether the mildews can be divided into two groups, one forming perithecia readily and the other with difficulty. It is more likely that they are all capable of sexual reproduction, the actual occurrence of which depends largely on the degree of genotypical adaptation of the host to this particular purpose.

LABROUSSE (F.) & SAREJANNI (J.). **Recherches physiologiques sur quelques champignons parasites.** [Physiological studies on some parasitic fungi.]—*Phytopath. Zeitschr.*, ii, 1, pp. 1–38, 1930.

A study was made of the phenomena of oxido-reduction and the changes produced in the reaction of a standard agar medium (with the addition of appropriate indicators) by the growth of certain fungi [cf. *R.A.M.*, viii, p. 260]. The results of the investigations [which are fully described with details of the technique employed] were confirmed and supplemented by the examination of cultures of the same organisms on standard liquid media.

Certain fungi were found to produce an alkaline reaction in the medium and others an acid one. To the former group belong *Ophiobolus herpotrichus*, *Rhizoctonia* [*Corticium*] *solani*, *Leptosphaeria herpotrichoides*, *Fusarium nivale* [*Calonectria graminicola*], *Verticillium tracheiphilum*, *Wojnowicia graminis*, *Cladosporium fulvum*, *C. cucumerinum*, and *Helminthosporium sativum*; the latter includes *Sclerotium rolfsii*, *Sclerotinia minor*, *S. intermedia*, *S. libertiana* [*S. sclerotiorum*], *Phytophthora nicotianae*, *Blepharospora* [*P.*] *cambivora*, *Pythium de Baryanum*, *Fusarium culmorum*, *F. avenaceum*, and *O. graminis*.

It was observed that the fungi forming only a scanty aerial mycelium, e. g., *S. sclerotiorum*, *S. rolfsii*, and *O. graminis*, showed less evidence of reduction in the presence of indicators than those producing abundant vegetative growth (*V. tracheiphilum*, *P. de Baryanum*, *Phytophthora nicotianae*, and *P. cambivora*). *Thielavia basicola*, the only one of the fungi studied to oxidize guaiacol, was also the only one incapable of reducing any of the indicators used. All the fungi producing an alkaline reaction of the medium likewise proved capable of reducing nitrates to nitrites. This property, therefore, would seem to bear no relation to the pathogenic capacity of the fungi concerned.

PETRI (L.). **Esperienze sulla formazione del sughero delle ferite.** [Experiments on the formation of wound cork.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 4, pp. 327–352, 2 figs., 1929.

A full account is given of the author's investigations into the formation of suberized cells in plant tissues following wounds. The conclusions reached may be briefly summarized as follows.

Haberlandt's so-called 'wound hormones' are produced by the oxidation of a substance commonly present but normally inactive in the cells of living plants. This substance is made active by contact with oxygen, either directly through exposure to air, or through the intervention of the oxidases which accumulate in the wound.

As far as non-specific action is concerned, the product of active oxidation must be regarded as the substance which renders possible the first phase of the process of stimulation, determining those physical and perhaps chemical changes in the cytoplasm which are transmitted from protoplast to protoplast until they reach cells which are in a condition to react to the stimulation by division and the formation of suberized walls.

It is very improbable that the product of active oxidation is itself diffused through the living cells and along the intercellular spaces, or that it is absorbed by the cell membranes.

The unhealthy condition of the cells in the vicinity of the wound assists in setting up the traumatic stimulation; this unhealthiness follows upon the action of the products of this disorganization of dead or injured cells, which in turn results from sudden variations in the trophic conditions of the cytoplasm and the action of saprophytes which develop on the surface of the wound. According to the greater or less degree of this unhealthiness, the cells capable of reacting by division and the formation of phellogen are situated more or less deeply in the tissue.

The action of saprophytic micro-organisms developing on the surface of the wound is not necessarily a condition for the formation of phellogen, but occasionally stimulates it [*R.A.M.*, viii, p. 663]. When, however, the vital activity of the organ is much depressed, the products of the metabolism of these saprophytic organisms may inhibit cork formation or permit it only in deep layers of cells.

The mode of origin and the properties of the wound substance are such that, in the author's opinion, it cannot properly be termed a hormone.

VINCENT (C. L.). **Potato breeding problems.**—*Proc. Sixteenth Ann. Meeting Potato Assoc. of America, December 30, 1929–January 1, 1930*, pp. 63–69, 1930.

In pursuance of a potato breeding project initiated in 1924, attempts are in progress at the State College of Washington (Division of Horticulture), to develop commercially valuable varieties resistant to, or immune from, mosaic, which is stated to be particularly destructive in the State. According to the 1929 report of the 65 certified Netted Gem seed potato plots at Mount Vernon, a few of the plots showed 33·5 per cent. mild mosaic [*R.A.M.*, ix, p. 475], while the plots as a whole averaged 4 per

cent. of mild and rugose mosaic and leaf roll combined. At present there are 100 seedling crosses or selfed individuals from a number of standard varieties which have remained healthy for one to five years under field conditions, a row of infected plants being interspersed between every two to four rows of seedlings. Most of the resistant or immune crosses have McCormick, Keeper, or Early Norther as one or both parents. Of the 100 above-mentioned seedlings, 63 are crosses with McCormick as the male parent. One seedling with Bovee and one with American Wonder as the male parent have been growing without injury in the field each summer since 1925. Another very promising seedling is one from an open-pollinated Burbank blossom which has remained healthy in the field every summer since 1923, while five others of the same type have been exposed to infection without injury since 1924.

Some of the most promising seedlings originating at Mount Vernon are stated to have failed completely on transference to the irrigated sections of Washington, showing up to 75 per cent. mosaic, and it is considered highly unlikely that any variety ever developed will maintain its freedom from disease under all types of climatic condition.

McCall (T. M.). **The effects of certain cultural practices on the transmission of virus diseases of the Potato.**—*Proc. Sixteenth Ann. Meeting Potato Assoc. of America, December 30, 1929–January 1, 1930*, pp. 161–163, 1930.

In northern Minnesota spindle tuber has been found to cause the heaviest losses (up to 40 per cent. of the crop) among Early Ohio and Irish Cobbler potatoes, while Bliss Triumph is chiefly affected by mosaic [*R.A.M.*, vii, p. 597]. The results of experiments [which are briefly described] in the transmission of spindle tuber by the cutting knife corroborated those of Goss [ibid., v, p. 443] in clearly demonstrating the importance of this mode of contamination. Seed treatment with acidulated corrosive sublimate after infection reduced by 39 per cent. the incidence of spindle tuber subsequently developing in Triumph but not in Irish Cobbler.

Kotila (J. E.). **Roguing and Potato virus disease control.**—*Proc. Sixteenth Ann. Meeting Potato Assoc. of America, December 30, 1929–January 1, 1930*, pp. 164–168, 1930.

In the summer of 1928 an experiment was undertaken to obtain some data on the effect of roguing on virus disease control at East Lansing, Michigan. Single tuber clone stock of the Bliss Triumph, Irish Cobbler, Early Ohio, Spaulding Rose No. 4, Green Mountain, and Russet Rural varieties was planted about 24th June. The field was rogued at weekly intervals beginning about six weeks after planting (8th August). At the first roguing the diseased hills and the two adjoining ones were removed, but on all subsequent occasions only the infected hills were eradicated. The field was sprayed six times against aphids with Bordeaux mixture plus $1\frac{1}{4}$ to $1\frac{1}{2}$ pints of nicotine sulphate per 100 galls. of solution. After the first roguing, primary streak (the symptoms

of which were practically identical with those of rugose mosaic) [*R.A.M.*, ix, p. 475] and primary leaf roll were the only diseases found in the field, but they spread rapidly.

The hills diagnosed as primary leaf roll showed no very pronounced symptoms, being characterized only by a slight yellowing of the laminae and an upward curling of the margins of the leaflets in the terminal growth of the main stems. However, tubers selected from six hills showing such symptoms all produced typical leaf roll plants in the greenhouse the following winter. After the last roguing the field was apparently free from virus diseases and could have passed the requirements for certification.

Fifty out of 75 tubers of each clone selected at random along the rows at harvest time were indexed in the greenhouse during the next winter. Despite the precautions taken in the matter of aphid control a very high percentage of disease was found to be present when these tubers were tested. Mosaic and leaf roll were most prominent, doubtless because of the absence of current season symptoms of these diseases. It is probable that weed hosts (*Solanum dulcamara* and *Physalis grandiflora*) acted as sources of mosaic infection. The Bordeaux-nicotine sulphate spray was apparently only sufficiently toxic to make the insects restless, thereby causing an increase rather than a reduction in the extent of virus dissemination.

Brown (W.) & Blackman (V. H.). **Field experiments on the deterioration of Scotch Potato seed in England.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 1–27, 3 graphs, 1930.

A full account is given of experiments which were carried out from 1922 to 1924, inclusive, at Rothamsted, the South-eastern Agricultural College, Kent, and the Harper-Adams Agricultural College, Shropshire, in an attempt to obtain data on the nature of the deterioration, i. e., loss of cropping power, of potato stocks cultivated in a given locality for a period of years. To this end, high grade seed tubers of the Great Scot, Kerr's Pink, and King George varieties were imported from the north of Scotland, and carefully controlled tests were made of the effect of immaturity of the seed tubers and of shading the plants in the field, so as to protect them from overheating, on the weight of their produce. The results showed that neither of these two factors had a significant influence on the yield in plots free from virus diseases or where these diseases were present to a very limited extent, nor, in similar circumstances, was there any significant difference between the produce of freshly imported Scotch seed tubers and that of tubers grown at the above Stations for one or two years. In plots, however, in which infestation with virus diseases was considerable, all types of seed tubers showed a significant reduction in yield, the reduction being less marked in the produce of tubers that had been lifted at a very early date. There was some evidence that very immature tubers are intrinsically inferior in cropping power to tubers harvested at the normal time, apart from the effect of virus diseases. In general, the reduction in cropping vigour appeared to be directly correlated to the amount of virus diseases present in the plots, and the balance of evidence indicated that the purely

physiological effect arising from early lifting of tubers or from shading the plants, even if it did exist, was of little account.

Further experiments from 1925 to 1928 showed that the yielding power of deteriorated potato stocks may be restored to a great extent by roguing in the field, since certain of the stocks in the seventh year of their cultivation in England yielded in 1928 as heavily as fresh Scotch tubers. This was attained, however, by such drastic roguing as to render it uneconomic, and there were indications that, short of a process of very rigorous segregation and selection, the elimination of the streak type of virus disease from an infected stock is impossible.

An assessment of the statistical significance of the data obtained in the experiments showed that the significant percentage drop in cropping power of the locally grown seed tubers, as compared with that of Scotch tubers, varied from 7 to 20, the average being 11·8 per cent., corresponding to a reduction in yield of about 1·2 tons per acre.

SCHLUMBERGER [O.]. **Prüfung von Kartoffelsorten auf Widerstandsfähigkeit gegen den gewöhnlichen Kartoffelschorf (Actinomyces-Schorf).** [Testing of Potato varieties for resistance to common Potato scab (*Actinomyces* scab).]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 2, p. 11, 1930.

The following results were obtained in the official German tests (1929) for the reaction of a number of commercial potato varieties to common scab (*Actinomyces*) [*scabies*: *R.A.M.*, ix, p. 126]. (1) Resistant: Erdgold, Ragis Zehn, Rotkaragis, and Wotan. (2) Less resistant: Deodara, Gelkaragis, Lützow, and Max Delbrück. (3) Fairly susceptible: Gratiola, Gustav Adolf, Hutten, Paul Wagner, and Wekaragis. (4) Highly susceptible: Berggeist, Bergglück, Blaupunkt, Cepa, Franz, Gamma, Jupiter, Korund, Preussen, Roland I, Roon, Schenkendorf, Schles. Klössel, Sickingen, Stärkereiche, U 9, and Winterragis.

BOTJES (J. O.). **Bodemontsmetting ter bestrijding van de Aardappelwratziekte.** [Soil disinfection for the control of the Potato wart disease.]—*Tijdschr. over Plantenziekten*, xxxvi, 2, pp. 17–22, 1930.

An account is given of the experiments conducted at Oostwold (Holland) in 1928–9 to determine the efficacy of soil disinfection in the control of potato wart [*Synchytrium endobioticum*] in the susceptible Bravo variety [cf. *R.A.M.*, viii, p. 262]. It was found that four very heavy applications of formalin, amounting in all to 250 l. of a 4 per cent. solution per 25 sq. m., permeating the soil to a depth of 35 cm., reduced the incidence of infection to a minimum in 1928 (5 out of 48 plants compared with the whole 48 in the control plot). In 1929, however, the same variety when planted on the same plot contracted severe infection (42 out of 48 plants), indicating that the effect of the formalin does not persist beyond the season of application. Neither a bare fallow of one year nor cultivation of a resistant variety for one year had any appreciable effect in reducing infection in the Bravo variety.

GRATZ (L. O.). **Potato dusting and spraying experiments in Florida from 1924 to 1928.**—*Proc. Sixteenth Ann. Meeting Potato Assoc. of America, December 30, 1929–January 1, 1930*, pp. 146–154, 1930.

The results of a series of dusting and spraying experiments conducted at Hastings, Florida, from 1924 to 1928 for the control of early and late blights of potatoes [*Alternaria solani* and *Phytophthora infestans*: *R.A.M.*, viii, p. 124; ix, p. 265] are discussed and tabulated. Bordeaux mixture 4–4–50 and 5–5–50 and copper-lime dust 20–80 were compared, the number of applications ranging from four to six.

It was found that spraying controlled late blight a little better than dusting, and was slightly effective against early blight which is not amenable to control by the latter process. Where both operations are carefully and thoroughly conducted and equivalent amounts of copper used, spraying and dusting may produce similar increases of yield over the untreated rows. The comparative costs of spraying and dusting were calculated on two farms, one of 160 acres where the potatoes were thoroughly sprayed, and the other of 100 acres where they were well dusted. Estimating the life of the sprayers as 3,200 acres and that of the duster 3,000 acres, with 25 lb. per acre as the average amount of dust used, the following figures per acre were obtained for each application: initial cost of equipment \$0·108 for dusting and \$0·2188 for spraying; cost of materials, \$1·50 and \$0·730, respectively; labour, \$0·150 and \$0·180, respectively; team hire, \$0·150 and \$0·180, respectively; total per application per acre, \$1·883 and \$1·439, respectively, showing an increased cost of about \$0·44 for dusting as compared with spraying. The ease with which dusting is carried out is counter-balanced, in the writer's opinion, by the fact that the work can only be satisfactorily performed in the absence of wind and in the presence of moisture—usually at night or early morning.

KOTTE (W.). **Beobachtungen über den Parasitismus von Rhizoctonia violacea Tul. auf der Kartoffel.** [Observations on the parasitism of *Rhizoctonia violacea* Tul. on the Potato.]—*Ber. Deutsch. Bot. Gesellsch.*, xlviii, 2, pp. 43–51, 3 figs., 1930.

Rhizoctonia violacea [*Helicobasidium purpureum*: *R.A.M.*, viii, p. 527], which normally occurs in a harmless, epiphytotic form on the potato, was found, in the autumn of 1929, to be causing some damage to this host on the Loess soils of the Breisgau district of Germany.

While many of the tubers merely showed the reddish-purple mycelial network on the uninjured skin, others exhibited dark grey, somewhat sunken spots near which the skin was covered with the purplish-black sclerotia of the fungus. Below these spots was a narrow zone of chalk-white, brittle, dry rotted tissue, sharply delimited by a brown strip. Each sclerotium was connected with the interior of the tuber by a bundle of hyphae. Entry to the tuber evidently occurred through the periderm (which, in the case of the affected Edeltraut variety, is intersected by fissures). The fungus does not appear to have penetrated far below the fourth cell layer below the periderm. Beneath the dead dry zone was a sharply

delimited, brown layer, two to eight cells deep, the walls of which give the suberin reactions and a faint lignin reaction. Below this layer again was one which the fungus had not penetrated, and here the wound periderm was formed. The inner tissues of the tuber were perfectly sound.

The normally weak parasitism of *H. purpureum* seems to have been favoured in the above-mentioned case by special conditions, foremost among which was the cultivation of lucerne preceding the potato crop. In such cases it may easily assume greater importance than the foliage diseases, since infected tubers are liable to further decay in storage and may also contaminate their healthy neighbours.

HEMMI (T.). **On the relation of soil moisture to the development of the Rice blast disease.**—*Agric. & Hort.*, iv, pp. 1143–1154, 1 pl., 1929. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 1, p. (4), 1930.]

The results of inoculation experiments with the causal organism of rice blast (*Piricularia oryzae*) [*R.A.M.*, viii, p. 460] on plants grown in soil of varying moisture content indicated that the more humid the soil, the lower the rate of infection, and conversely, the longer the duration of the dry period, the higher the incidence of blast.

HEMMI (T.) & ENDO (S.). **On the possibility of soil infection of Piricularia oryzae and its relation to soil moisture.**—*Agric. & Hort.*, iv, pp. 773–784, 1 pl., 1929. (Japanese.) [Abs. in *Japanese Journ. of Botany*, v, 1, p. (4), 1930.]

Piricularia oryzae [see preceding abstract] has been found capable of penetrating the roots of rice seedlings through the soil, causing infection and ultimate death. The possibility of infection depends greatly on the moisture content of the soil. If there is a layer of water on the surface of the soil, the infective capacity of the fungus is very slight, partly on account of its development being suppressed by lack of oxygen.

ABE (T.). **On the influence of copper sulphate to the growth of Piricularia oryzae, with special reference to the temperature as an environmental factor.**—*Ann. Phytopath. Soc. Japan*, ii, 3, pp. 171–196, 11 graphs, 1930. [Japanese, with English summary.]

The optimum temperature for mycelial growth in the strain of *Piricularia oryzae* [see preceding abstracts] used in the writer's experiments was found to be about 28° C., at which point the development of the fungus was stimulated by the addition of copper sulphate to the agar medium at concentrations between 1/400 and 1/6,000 mol. This stimulatory action was not apparent at 20°, 24°, 32°, and 36°. Conidial formation was retarded at all temperatures in inverse ratio to the amount of $CuSO_4$ at concentrations above 1/6,000 mol., under which conditions chlamydospores were formed at all the temperatures tested, while the colour of the colonies underwent striking changes.

Suzuki (H.). **Experimental studies on the possibility of primary infection of Piricularia oryzae and Ophiobolus miyabeanus internal of Rice seeds.**—*Ann. Phytopath. Soc. Japan*, ii, 3, pp. 245–275, 1 pl., 1 fig., 1930. [Japanese, with English summary.]

Rice grains or kernels internally infected by *Piricularia oryzae* [see preceding abstracts] or *Ophiobolus miyabeanus* [*R.A.M.*, vii, p. 55; viii, p. 529] generally show a visible discoloration ranging from a small spot or streak to a large area covering the whole surface, sometimes accompanied by shrivelling. Both fungi appear, from the results of inoculation experiments, to be capable of infecting the seeds from their origin to after maturity. Both, too, can infect the young seedlings shortly after germination in the spring. *P. oryzae* may hibernate for at least two years in rice grains without losing its viability, and *O. miyabeanus* for four years. *P. oryzae* from the interior of rice grains is killed in five minutes by immersion in hot water (50° C.), the corresponding temperature for *O. miyabeanus* being 55°.

Murray (R. K. S.). **Diseases of Rubber in Ceylon, 1929.**—*Trop. Agriculturist*, lxxiv, 2, pp. 75–78, 1930.

This is a brief report, compiled much on the same lines as the previous one [*R.A.M.*, viii, p. 599], on the principal fungal diseases which attack *Hevea* rubber in Ceylon. The points of special interest in it have already been noticed from other sources [ibid., ix, pp. 55, 200]. [This paper is also printed in the *Fourth Quart. Circ. for 1929, Rubber Res. Scheme* (Ceylon), pp. 5–8, 1930.]

Demonstratie van zwavelbestuivingen tegen meeldauw, gehouden op Zaterdag 25 Januari 1930 op de onderneming 'Tjimoelang' bij Buitenzorg. [Demonstration of sulphur dusting against mildew held on Saturday, 25th January, 1930, on the 'Tjimoelang' estate near Buitenzorg.]—*De Bergcultures*, iv, 5, pp. 112–125, 8 figs., 1930.

Technical details are given concerning the construction and application of various types of apparatus used for dusting with sulphur against *Hevea* rubber mildew [*Oidium heveae*] in Java. The working of the following machines was demonstrated on 25th January, 1930, on the Tjimoelang estate near Buitenzorg: Björklund 1930 [*R.A.M.*, ix, p. 128]; Holder 1929; a modified portable Holder named Holder 1930 III; and an apparatus known as Holder IV, mounted on a wheelbarrow; Platz 1929 and 1930 (the latter a large model for horse transport) [ibid., ix, p. 57]; Sulzer 1929 [ibid., ix, p. 129]; and four hand dusters, viz., Niagara Blower dust gun, Savage duster, Holder Rebschwefler Tip-top, and a simple and economical bellows apparatus. The Björklund, Holder, and Platz machines are all furnished with D.K.W. engines (6 h.p.), while the Sulzer runs on a 2 h.p. Zehnder engine. The prices of the apparatus are as follows: Björklund 1930, Fl. 825; Holder 1930, Fl. 725 (750 with wheelbarrow); Platz 1930, Fl. 1,250; and Sulzer 1929, Fl. 1,200, 1930 (not yet tested in Java), Fl. 815. It is estimated that the Björklund and Sulzer 1929 apparatus can cover 15 bouw [1 bouw = 0·71 hect.] per hour. Two other types

of machine were shown at the demonstration, viz., an electrically driven apparatus and the Kroempoet motor duster, while a display of aeroplane dusting [ibid., ix, p. 337] was also given. Several of the appliances and the methods of working them are illustrated.

O'Brien (T. E. H.). **Notes on streakiness in blanket crepe.**—*Trop. Agriculturist*, lxxiv, 2, pp. 71–74, 1930.

Streakiness or discoloration of blanket crepe rubber caused by the development of surface moulds [*R.A.M.*, viii, p. 600; ix, p. 337] is stated to show a tendency to increase in Ceylon, probably owing to the progressive infection of the drying sheds. Apart from the sanitation of the sheds by treating the floor boarding with a 10 per cent. solution of the wood preservative 'Atlas A' and by frequently washing all the apparatus and other woodwork with a 2 per cent. solution of formalin, the treatment of the latex with 1 part paranitrophenol to 4,000 parts latex is recommended. The blanket crepe so treated should be protected against direct light, which discolours it. In a series of experiments it was established that unless excessive, the presence of iron in the water used for diluting and coagulating the latex does not seriously affect the colour of the crepe. In one case the streakiness of the blanket crepe was traced to adulteration of the latex by the local tappers with an unknown substance. [This paper is also printed in the *Fourth Quart. Circ. for 1929, Rubber Res. Scheme* (Ceylon), pp. 1–4, 1930.]

Willis (L. G.) & Mann (H. B.). **Manganese as a fertilizer. Experiments on South Atlantic Coastal Plain soils. Only within recent years has the application of manganese compounds been considered of any practical importance.**—*Amer. Fertilizer*, lxxii, 1, pp. 21–25, 4 figs., 1 diag., 1930.

Soy-beans on the soils of the South Atlantic Coastal Plain (North Carolina), which are heavily limed to counteract their natural acidity, suffer from at least three distinct types of chlorosis, all of which are locally known as 'frenching'. That caused by magnesium deficiency is characterized by interveinal chlorosis, especially at the base of the plants, which bear a general resemblance to tobacco plants affected by 'sand drown' or 'magnesium hunger' [*R.A.M.*, viii, p. 681]. Potash deficiency in soy-beans is expressed by a yellowing of the leaf margins, closely followed by drying of the tissues and curling of the leaves. In manganese deficiency of moderate severity the chlorotic symptoms appear at the apex rather than at the base of the plant. Badly affected leaves may turn quite yellow, with enlarged veins and very thin interveinal tissue. A dilute solution of manganese sulphate sprayed on the leaves is an effective remedy for this type of chlorosis. Diseased leaves have also been found to become green when dipped in a very weak solution of manganese sulphate (1 in 100,000). Similar experiments with ferric chloride, ferric tartrate, ferric citrate, copper sulphate, barium chloride, and magnesium sulphate gave negative results. Chlorosis in strawberries and string beans [*Phaseolus vulgaris*] may also be cured by treatment with manganese sulphate.

Korff (G.) & Böning (K.). **Beiträge zur Bodenbehandlung und partiellen Bodendesinfektion.** [Contributions to soil treatment and partial soil disinfection.]—*Phytopath. Zeitschr.*, ii, 1, pp. 39–86, 3 pl., 1930.

In connexion with a series of experiments [which are fully described and tabulated] on various methods of soil treatment intended to reduce the incidence of disease, the authors tested the value of some disinfectants in the control of certain diseases associated with soil fungi, especially the root rot of beets due to *Pythium de Baryanum*. It was found that the only substances of any practical utility for this purpose were corrosive sublimate (5, 7·5, or 10 gm. per sq. m.), formalin (0·2 to 3 per cent., 1 l. per $\frac{1}{6}$ sq. m. of soil surface), calcium cyanamide (40 gm. per $\frac{1}{6}$ sq. m.), and caustic lime (80 gm. per $\frac{1}{6}$ sq. m.). Certain substances, e. g., calcium cyanamide, lime arsenate (40 gm. CaO, 1 gm. As_2O_3), aniline (20, 40, or 60 gm.), and nitrobenzol (12, 24, or 36 gm.) produced a temporary toxic effect leading to a reduced absorption of nutrients and a temporary state of starvation in the plants which rendered them resistant to fungous parasites [cf. *R.A.M.*, ix, p. 473].

Ikata (S.). **Studien über die Rostkrankheit japanischer Minze.** [Studies on the rust disease of Japanese Mint.]—*Mitt. Landw. Versuchsstat. Okayamaken*, 34, 115 pp., 15 pl., 7 figs., 1929. [Abs. in *Japanese Journ. of Botany*, v, 1, pp. (5)–(6), 1930.]

Puccinia menthae, which occurs in Japan on *Mentha arvensis* var. *piperascens* [cf. *R.A.M.*, viii, p. 790], has been found to be strictly autoecious. The aecidia are accompanied by pycnidia. The aecidiospores can germinate during a period of only two to five weeks, compared with 187 days (under favourable conditions) for the uredospores, the optimum temperature for the germination of which is 18° C., with a maximum at 30°.

The mode of infection by aecidio- and uredospores is through the stomata on the lower surface of the leaf. Appressoria and substomatal vesicles are formed, and even on the rust-immune variety, *M. piperata*, the author observed that the mycelium reaches the stage of haustorial mother-cell development before being checked in its development by the death of the host cells. Under favourable external conditions the uredospores may survive the winter and produce fresh infections in the following spring. Teleutospore formation appears to be correlated with low temperatures.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1929.**—*Journ. Inst. of Brewing*, N.S., xxvi, 2, pp. 63–67, 1930.

Owing to the hot, dry summer of 1928, downy mildew of hops (*Pseudoperonospora humuli*) was absent at picking time, but nevertheless the young bines were attacked at the inception of growth in 1929 [*R.A.M.*, viii, p. 462]. The production of basal spikes appeared to be almost as frequent in 1929 as in the preceding year, and spore production on them was prevalent on 30th April, after a lengthy period of drought and cold winds followed by rain on the 28th to 30th. The succeeding spell of

warm, dry weather checked infection, with the result that terminal spikes were less common than in 1928. The prompt and efficient removal of all spikes in a hop garden of 6½ acres was secured by employing one woman from 30th April to 1st May and 8th to 10th May, two women on 16th and 17th May, and one youth from 23rd to 29th May, on 10th June, and from 2nd to 4th July.

In the first six basal spikes developing early in 1929 on pot plants in a cold greenhouse, the hyphae of *P. humuli* extended continuously from the root-stock into the spikes. A fortnight later five spikes from the garden at Wye were also found to contain mycelium from the root-stock to the spike, while in 19 the hyphae could not be traced lower than the base of the spike. It appears, then, that the majority of spikes either arise from infected buds or become infected in the early spring by zoospores. However, in the eleven cases where mycelium was found both in the root-stock and spike, it is possible that the hibernating mycelium was the cause of the spiked growths [ibid., ix, p. 60]. Details are also given of the infection of strap-cuts [see next abstract].

Hop spraying has now been facilitated by the invention of the so-called 'Bordeaux Spray Blower' (Messrs. W. Weeks & Son, Ltd., Maidstone), a machine attachable to any hop-washer, in which an air current (generated by a fan driven by a small motor) is used to disperse and blow upwards the spray liberated from five nozzles. Home-made Bordeaux mixture (1 per cent.) has proved to be quite safe for use on hops, even when just coming into or going out of burr, and one application, at any rate, may be given without risk even in full burr.

Salmon (E. S.) & Ware (W. M.). **Downy mildew in the Hop root-stock and in strap-cuts.**—*Journ. Kent Farmers' Union*, xxv, 2, p. 54, 1929.

Attention is drawn to the occurrence of hop downy mildew [*Pseudoperonospora humuli*: see preceding abstract] in strap-cuts (the swollen bases of the bines of the current season) on the hill. During the winter of 1928–9, some 30 per cent. of the hills examined showed the presence of severe infection in the strap-cuts. The buds of diseased straps are small and retarded and appear browner than the normally swollen buds on healthy cuts, owing to the retention of the scaly covering. The pale outer surface of the infected strap shows irregular, dark brown blotches, and a similar discoloration is visible in the cut tissues. Possibly the strap-cuts may be invaded by mycelium from the root-stock, but more probably the infection occurs at an earlier stage through the agency of spores produced in neighbouring terminal or basal spikes. If the mycelium in the strap-cuts grows downwards into the root-stocks, the health of the hills is seriously threatened.

Newton (W.) & Yarwood (C.). **Substances toxic to the downy mildew of the Hop.**—*Journ. Inst. of Brewing*, N.S., xxvii, 2, pp. 67–68, 1930.

Studies were carried out at the Dominion Plant Pathology Laboratory, Saanichton, British Columbia, to determine the

critical dilution of substances that would destroy the motility of zoospores of hop downy mildew (*Pseudoperonospora humuli*) within two minutes [*R.A.M.*, ix, p. 59].

The sap bled from cut tips of hop plants both of the resistant Fuggles and the susceptible Clusters variety was found to be very toxic, but sap from cut stems at the base of the plant was practically non-toxic.

A solution of resin, methyl alcohol, and potassium hydroxide (5–5–1) was found to be much more toxic to *P. humuli* than copper sulphate, and in some cases to equal mercuric chloride in toxicity, though the average value is considerably lower. The methyl alcohol was found to contribute very little towards the toxicity of the mixture, and a concentration of potassium hydroxide ten times greater than that present in the resin solution is required to produce the same toxic effect. Resin may possibly be used in spraying operations as a substitute for copper, to which objections have been raised in many quarters.

The following are some of the toxicity ranges that were found in different tests in dilutions with tap water. Sap bled from cut tips of hop plants, diluted 200–2,000 times; sap bled from cut stems at bases of hop plants, 1–2; resin, CH_3OH, and KOH (5–5–1) 5,000–40,000 (hydrogen- and hydroxyl-ions); copper sulphate 2,000–10,000; mercuric chloride 40,000–80,000; methyl alcohol 10–20; tannic acid 1,000–4,000; expressed as normalities: calcium hydroxide 0·01N–0·002N; sodium hydroxide 0·01N–0·002N; potassium hydroxide 0·01N–0·002N; hydrochloric acid 0·0025N–0·0008N; and sulphuric acid 0·0025N–0·0008N.

Wiles (D. R. D.). **Report of the Plant Diseases Inspector for the year 1928–29.**—*Ann. Rept. Dept. of Agric. Barbados for the year 1928–29*, pp. 85–88, 1930.

During the period under review inspections of sugar-cane for mosaic were continued in Barbados, when it was found that maize and sorghum growing in areas previously proclaimed infected [*R.A.M.*, viii, p. 815] were suffering from mosaic, *Aphis maidis* being invariably present on the bases of the inner leaves. A close season for maize and sorghum was, therefore, ordered by Proclamation, to extend from 1st December, 1928, until 31st March, 1929, inclusive. The distribution of healthy canes to planters in diseased areas, first begun in 1927, was continued with satisfactory results. Growers are gradually becoming educated to systematic inspection and roguing.

B[arber] (C. A.). **Leaf scald.**—*Internat. Sugar Journ.*, xxxii, 374, pp. 65–70, 1930.

The author gives a condensed account in popular terms of North's paper on leaf scald of sugar-cane [*Bacterium albilineans*] which has already been noticed [*R.A.M.*, viii, p. 669].

Boedijn (K. B.). **Beitrag zur Kenntnis der Pilzflora von Sumatra.** [Contribution to the knowledge of the fungous flora of Sumatra.]—*Recueil Trav. Bot. Néerlandais*, xxvi, 2–3–4, pp. 396–439, 17 figs., 1929.

This list of 142 fungi collected by the author since 1920 in

Sumatra contains a number of interesting records, of which the following may be mentioned.

Phomopsis heveae (Petch) Boedijn nov. comb. on dead rubber branches is believed to be identical with the fungus described by Petch as *Phlyctaena heveae*. There are two types of conidia, one long, slender, hyaline, unilaterally uncinulate, 24 to 32 by 1·5 to 2 μ, and the other elliptical, hyaline, 5 to 8 by 3 to 4 μ, with an oil drop at each end. It is thought that Petch's diagnosis was based only on the former type.

Coniothyrium coffeae Zimm. occurs on living leaves of *Coffea arabica* [*R.A.M.*, v, p. 160].

Coniothyrina agaves (Dur. et Mont.) Pet. et Sydow was found on living leaves of *Agave rigida* var. *sisalana*. The same host is liable to infection by *Botryodiplodia agaves* Petrak, the hyaline (later black) conidia of which measure 22 to 27 by 14 to 16 μ, and by *Colletotrichum agaves*.

Thielaviopsis [*Ceratostomella*] *paradoxa* occurs in profusion on the freshly felled stems of oil palm (*Elaeis guineensis*) [ibid., vii, p. 496], and has also been found on the fruits of *Arenga pinnata* and pineapple.

A list of 55 fungi reported by other workers from Sumatra prior to 1920 is given and a bibliography of 37 titles is appended.

SIDERIS (C. P.). **The proper taxonomic classification of certain Pythiacious organisms.**—*Science*, N.S., lxxi, 1838, pp. 323–324, 1930.

This is a slightly expanded account of the writer's recent researches on the taxonomy of the Pythiaceae [*R.A.M.*, ix, p. 343], as a result of which he advocates the establishment of a generic distinction between *Pythium* and *Nematosporangium*. On this basis it is proposed that the organisms hitherto known as *P. aphanidermatum* (Eds.) Fitz., *P. butleri* Subram. [ibid., vii, p. 488], and *P. arrhenomanes* Drechsler [ibid., viii, p. 168] be renamed *N. aphanidermatum* (Eds.) Fitz. comb. nov., *N. butleri* (Subram.) comb. nov., and *N. arrhenomanes* (Drechsler) comb. nov.

TAMIYA (H.) & MORITA (S.). **Bibliographie von Aspergillus. 1729 bis 1928. (Fortsetzungen XI–XIII).** [Bibliography of *Aspergillus*. 1729–1928. (Continuations XI–XIII).]—*Bot. Mag.*, Tokyo, xliv, 517, pp. 1–7 ; 518, pp. 79–89 ; 519, pp. 139–150, 1930.

These continuations of the authors' comprehensive bibliography of the genus *Aspergillus* from 1729 to 1928 comprise 379 titles covering the period from 1921 to 1926, inclusive [*R.A.M.*, ix, p. 411].

REICHERT (I.). **Palestine : root diseases caused by Rhizoctonia bataticola.**—*Internat. Bull. of Plant Protect.*, iv, 2, p. 17, 1930.

Rhizoctonia bataticola [*Macrophomina phaseoli*] has so far been isolated from 35 plants in Palestine, the greatest damage being caused to bean [*Phaseolus vulgaris*: *R.A.M.*, ix, p. 82], tobacco, sesame [*Sesamum indicum*], potato, sweet melon, pepper [*Capsicum annuum*], and tomato. Inoculation experiments have hitherto given successful results only on beans.

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Boedijn (K. B.) & Steinmann (A.). **Over de op Thee en andere cultuurplanten in Ned.-Indië optredende Helicobasidium en Septobasidium-soorten.** [On the *Helicobasidium* and *Septobasidium* species occurring on Tea and other cultivated plants in the Dutch East Indies.]—*Arch. voor Theecult. Nederl.-Indië, 1930*, 1, pp. 3–59, 29 pl. (2 col.), 1930. [English translation.]

One of the principal characters of *Helicobasidium* is the development of basidia directly from the hyphae, whereas in *Septobasidium* the basidia arise from globose, more or less thick-walled cells, the so-called probasidia [*R.A.M.*, ii, p. 146]; both genera have mostly bent, triseptate basidia. The character of the bent basidia, which suggested the name of *Helicobasidium*, is considered to be useless for differential purposes, since in most species of *Septobasidium* these organs are also curved, while a *Helicobasidium* with straight ones is known. Furthermore, a species of *Septobasidium* has recently been discovered in Java on *Erythrina lithosperma*, probably on the scale insect *Sasakiaspis pentagona* (*S. flavobrunneum* n. sp.), which is conspicuous by the absence of probasidia, the basidia beginning as small, thin-walled cells, which become clavate and septate, and which are formed directly from the hyphae of the hymenium, so that this feature alone is insufficient to distinguish between the two genera. More reliable criteria are that *Helicobasidium* forms an extensive mycelium in the soil, hyphae from which run up the roots of plants and penetrate the tissues as in true parasites [ibid., vii, p. 756]. Just above soil level the fruit bodies form, consisting of crusts of loosely interwoven hyphae, coloured within and hyaline on the exterior of the fructifications; on these hyphae the basidia and spores are borne directly. *Septobasidium* never shows a free mycelium. All the species examined by the writers were growing on scale insects, which were ultimately destroyed [cf. ibid., viii, p. 642]. They are seldom to be found near the soil, and their structure is much more complex than that of *Helicobasidium*.

In *S. tigrinum* n. sp., found on tea in a West Java estate in 1927, the thickening of the walls of the probasidia is very pronounced, whereas in *S. bogoriense* [loc. cit.] it is slight. *S. pilosum* n. sp., found on *Chionaspis bicluvis* on tea in 1929, is characterized by very loose columns, bearing probasidia on their whole length. This species produces a second form of fructification, namely, several closely compacted rows of two to four cells grouped into clusters measuring 40 to 65 by 26 to 30 μ. *S. tuberculatum* n. sp., found twice on tea, in Sumatra and Java, produces immense numbers of long-stalked, globose, hyaline to pale brown, thin-walled cells, 7·5 to 12·5 μ in diameter, the significance of which is obscure, just above the basal layer.

In addition to detailed observations on the above-mentioned species, notes are also given on *S. bogoriense* on a number of cultivated and wild plants, and on *S. cinchonae* on *Cinchona*, *Erythrina*, tea, *Crotalaria*, and *Morus*.

Helicobasidium compactum Boedijn, with which *H. purpureum* (Tul.) Pat. var. *orientale* Pat. ?, *H. mompa* Tanaka f. *macrosporum* Hara, and *S. compactum* Boedijn are regarded as synonymous, was

found on tea in Sumatra and on tea and *Tephrosia* in Java. It forms a cushion-like covering, brownish-violet when dry and dark purple-brown to black when wet, on the base of the stems, often girdling them and causing definite damage to these and other plants. On *Hevea* rubber and *Leucaena glauca* the fruiting bodies are very thick and the mycelial strands connecting them with the soil are conspicuous. *H. compactum* has also been found on the following hosts: *Tectona grandis*, coffee, *Vigna hosei* [*V. oligosperma*], *Actinophora fragrans*, *Indigofera endecaphylla*, and *Synedrella nodiflora*. A fruiting body was once found on the tapping surface of a rubber tree. The hyphae are brown, branched, septate, thin-walled, and measure 5 to 7·5 μ in width; they grow mainly in a vertical direction from the bark of the host plant. From the peripheral, hyaline hyphae arises the hymenial layer, measuring 100 to 125 μ in thickness, and bearing basidia, which are straight, then curved, uni- to triseptate, and measure 28 to 40 by 5 to 8 μ. Each basidial cell may give rise to a sterigma, measuring up to 25 by 1 to 2 μ and bearing hyaline, unicellular, elongate piriform spores (usually only two per basidium), 12 to 20 (or up to 32) by 4 to 5·5 μ. The differences between *H. compactum* and the related species, *H. purpureum* [ibid., viii, p. 527], *H. longisporum* Wakef. [ibid., v, p. 17], and *H. mompa* Tanaka [ibid., ii, p. 146], are enumerated.

Petch's observation that several species of *Septobasidium* sometimes attack the host plant, and thus assume a true parasitic character, has not been confirmed as regards either *S. bogoriense* or *S. cinchonae*. The tissues of the bark below the fungus crusts have always been found green and healthy, and no perceptible injury seems to be caused by *S. bogoriense* either on tea or green manures. So far *S. pilosum* is the sole species in which a large number of hyphae penetrate the plant tissues, but only so as to reach the scale insects which are more or less embedded in the bark. Control measures against *Septobasidium* spp. should therefore be directed against their insect hosts. On the other hand, *H. compactum* requires special combative treatment since it acts as a parasite; this includes the uprooting and burning of diseased material, cleaning the soil surrounding the trees, application of carbolineum-lime washes, and the like.

CURZI (M.). **Intorno a una malattia delle foglie di Thea sinensis.** [On a leaf disease of *Thea sinensis*.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 4, pp. 373–392, 9 figs., 1929.

A full account is given of a leaf spot of tea in the Botanic Gardens, Pavia, which results in moderately heavy defoliation during wet seasons. The spots, which measure 1 to 3 cm. in diameter and are chocolate-coloured, later whitish, usually first appear at the margins and spread inwards. A faint zonation surrounds them on young leaves, which curl slightly.

The affected tissues contain septate olivaceous hyphae, 1·5 to 2·5 μ in diameter. Between the epidermis and the palisade tissue the mycelium forms small, dark-olivaceous stromata which reach the surface by rupturing the epidermis. These stromata are at first flat and depressed, then tuberculate and 20 to 25 μ in diameter.

Conidia are borne in a layer on the tops of hyphae which become elongated and spread outwards, forming short, olivaceous conidiophores with an almost hyaline, simple, straight or flexuose, nodular apex. The conidia are filamentous, cylindrical or somewhat tapering at the tip, hyaline, later olivaceous, falcate and with rather indistinct septa. In nature they varied considerably, being 2- to 5-septate and ranging from 40 to 50 by 2 to 2·25 μ to 55 to 70 by 2·25 to 2·5 μ (mostly, 40 to 62 by 2 to 2·5 μ). In constantly damp conditions the spores were usually falcate, tapering slightly towards the apex, 4- to 9-, generally 5-septate, and ranged from 55 to 65 by 2 to 2·5 μ to 80 by 2·5 μ, 82 per cent. measuring 55 to 75 by 2 to 2·25 μ.

In culture different forms of sectorial variation appeared. In a colony from a transfer of mycelium from a single-spore culture, three forms were distinguished; the commonest showed an abundant rigid aerial mycelium of filamentous, sparsely branched hyphae; the second was more depressed, slightly zonate, and with much branched hyphae; while in the third the mycelium was almost lacking and consisted of very slender hyphae arranged in bundles.

The fungus is considered to be identical with that wrongly named *Septoria theae* by Cavara, but as the spores are not hyaline and there is no trace of pycnidia it is referred to the genus *Cercoseptoria* as *C. theae* (Cav.) n. comb.

No fruiting bodies other than the conidia were observed. On fallen leaves or leaves kept under suitably humid conditions globose sclerotial bodies, resembling immature perithecia, developed from the conidial stromata.

When aqueous suspensions of the conidia were applied to healthy leaves during wet weather, up to 50 per cent. became infected. The pathogenic action of the fungus was masked by the development of secondary organisms, especially *Phomopsis theicola* [*R.A.M.*, vi, p. 127], in the lesions. Inoculations with *P. theicola* failed to infect healthy leaves, but when the inoculations were made in lesions caused by *C. theae*, *P. theicola* developed rapidly, often spreading over and masking the primary infection.

GRAINGER (J.). **An attempt to cultivate the virus of Tobacco mosaic in vitro.**—*Proc. Leeds Phil. Soc.* (*Scient. Sect.*), ii, 1, pp. 33–35, 1929.

Details are given of two attempts made by the writer to cultivate the virus of tobacco mosaic *in vitro*. In one Olitsky's method was followed [*R.A.M.*, iv, p. 300], and in the other a chloroplast suspension was employed, using the technique devised by Lubimenko (*Rev. Gén. Bot.*, xxxviii, p. 381, 1926). In neither case was there any increase in virus concentration during cultivation (two months by Olitsky's method and eight by Lubimenko's); in fact, there was a definite loss of virulence in the latter case.

HILL (J. B.). **The zoogloeae of Bacterium tabacum and their relation to the problem of the migration of bacterial phytopathogenes through the host tissues.**—*Phytopath.*, xx, 2, pp. 187–195, 2 figs., 1930.

A study of the manner in which the causal organism of tobacco

wildfire (*Bacterium tabacum*) migrates through the tissues of its host showed that in all essentials the method is similar to that observed in the case of *Bact. tumefaciens* [*R.A.M.*, ix, p. 512], except that the former moves much more slowly, advancing zoogloeae being found only in material fixed 48 to 72 hours after inoculation. At this stage an abundance of the characteristically blunt, rounded tips of the zoogloeae were detected pushing their way through the irregularly-shaped intercellular spaces of the mesophyll. The bacteria are situated with their long axes in the direction of the advancing tip. They are most abundant in the older parts of the zoogloeae, where they may often be so crowded and stain so densely as completely to mask the matrix.

FAWCETT (G. L.). **El enruliamento de las hojas de la Tomatera.** [Curly top of the Tomato.]—*Rev. Indus. y Agric. Tucumán*, xx, 3–4, pp. 49–54, 3 figs., 1930.

Curly top [formerly known in the United States as western yellow blight, the symptoms of which are briefly described in popular terms] is stated to be one of the most serious diseases of tomatoes in Tucumán, Argentine Republic [cf. *R.A.M.*, viii, p. 633]. The results of experiments under controlled conditions [details of which are given] indicated that infection is transmitted from diseased beets to healthy tomatoes by the insect *Agallia sticticollis* [ibid., vii, p. 355]. The symptoms induced in tomatoes by this method were very much milder than those occurring in nature and involved only the growing point and the upper leaves, but nevertheless they may be considered sufficient to demonstrate the mode of transmission of curly top in the Argentine.

SANSONE (F.). **La produzione artificiale e la cura della 'tracheo-alternariosi' del Pomodoro nella Campania.** [The artificial production and control of tracheo-alternariosis of Tomato in the Campania.]—*Boll. R. Staz. Pat. Veg.*, N.S., ix, 4, pp. 397–408, 4 figs., 1929.

In further investigations [details of which are given] into the *Alternaria* wilt of tomatoes previously described by the author [*R.A.M.*, vii, p. 412], artificial infections of germinating seeds and seedlings with the conidia of the fungus gave positive results both under laboratory and field conditions.

Plants infected with this disease turn yellow, and the leaves nearest the collar wither; the wilt gradually progresses along the main axis, the leaves on the small branches remaining green though chlorotic. The flowers gradually wither as the wilt invades the branches and reaches the top of the stem, where the greatest amount of mycelium is found, occupying especially the larger tracheids, which become necrosed and disorganized to form cavities. The hyphae are at first very slender, but thicken as the disease progresses.

Diseased plants were not observed to recover. Control is recommended by seed and seed-bed disinfection and the use of resistant varieties.

Small (T.). **The relation of atmospheric temperature and humidity to Tomato leaf mould (Cladosporium fulvum.).**—*Ann. of Appl. Biol.*, xvii, 1, pp. 71–80, 1930.

This is a detailed account of experiments made in 1928 to determine the relation of atmospheric temperature and humidity to the development of tomato leaf mould (*Cladosporium fulvum*) under glass, a summary of the results of which has already been noticed from another source [*R.A.M.*, ix, p. 70].

Administration Report of the Forest Department of the Madras Presidency for the year ending 31st March 1929. Vol. ii, 1928–29.—345 pp., 1930.

This report contains some scattered references to the present status of the spike disease of sandal [*Santalum album*: *R.A.M.*, ix, pp. 276, 277] in the Madras Presidency. The disease has spread rapidly in the Yelagiris in Vellore division, where 4,886 spiked trees were counted during 1928–9. In North Salem fresh attacks were reported in the Guttiroyan reserved forest of the Dharmapuri range, while in Denkanikota reserved forest infection has spread considerably towards the north and east, 1,000 trees being diseased at the time of writing, compared with only 60 in February 1927. In Central Salem spike disease was prevalent on *Zizyphus* in the Harur range.

Verplancke (G.). **Une maladie intéressante du Châtaignier.** [An interesting disease of Chestnut.]—*Bull. Soc. Roy. Bot. de Belg.*, lxii (2nd Ser. xii), 2, pp. 105–107, 1 pl., 1930.

In 1928, the author noted vigorous young chestnut trees at Bruges showing elongated brownish lesions on one side of the trunk, which rapidly encircled it; the necrotic area became discoloured and characteristic cankers appeared. In old chestnuts the cankers developed without any preliminary necrosis, the bark becoming torn into thin vertical strips; in some cases the bark at the base of the tree was destroyed, and the fructification of *Coryneum kunzei β castaneæ* [the conidial stage of *Melanconis modonia*: *R.A.M.*, vi, p. 6; vii, p. 206] were found on the remaining pieces of bark on the trunk and on young branches. This fungus is stated to be new to the Belgian flora. In all cases very numerous adventitious branches formed below the infected area. The leaves appeared to be normal, except that they were somewhat chlorotic and occasionally showed reddish spots between the veins.

This condition differs from blight (*Endothia parasitica*), reported once in Belgium in 1924 [ibid., iv, p. 249], in that the mycelium was never found under the bark, the fructifications appeared late, no spore horns or tendrils were formed even under damp conditions, there was no hyperplasy of the bark, while in cultures a white mycelium was obtained which long remained sterile.

In 1929, cultures from the infected parts gave stromata and spores of *Cytospora ambiens*, the conidial stage of *Valsa ambiens* [ibid., vi, p. 5]. Fructifications of the former were found on the bark of very old chestnuts in the vicinity of Bruges. This fungus has long been present in Belgium.

Cookson (Isabel C.). **An account of a crown rot of English Walnut trees in Victoria.**—*Proc. Roy. Soc. Victoria*, N.S., xlii, 1, pp. 5–25, 1 pl., 26 figs., 1929.

A detailed account is given of the author's investigations into a root and collar disease of walnut (*Juglans regia*) present in the Bright district of Victoria for some years. Irregular black areas are found on the surface of the trunk at or just below soil level, and a dark fluid may accumulate in cavities in the cambial zone or exude as dark gummy drops to the surface of the bark. The leaves turn yellow, fall early, and eventually the tree dies. Many of the roots of all sizes show irregular dark brown lesions, extending into the wood, and exude drops of brown liquid on the surface. Non-septate hyphae were found intercellularly in the secondary phloem and cambium of diseased material, and intracellularly in the youngest layers of the wood. In cultures on sterilized soil or soil agar (but not on other media) the mycelium bore terminal, basally attached sporangia germinating by means of zoospores or more rarely by one or more germ-tubes and averaging 55·9 by 36·6 μ in diameter, with an average ratio of length to breadth of 1·5. Sympodial branching of the long conidiophores was sometimes observed. Chlamydospores, which remained hyaline, were also produced in numbers, their diameter ranging from 13·5 to 64·5 μ and averaging 35·96 μ. When an active culture was transferred to soil agar, oogonia were reproduced only among the hyphae of the original inoculum; they were yellowish-brown and measured 27 to 52·5 μ (average 42·2 μ) in diameter. The hyaline, later brownish, amphigynous, persistent antheridium completely surrounds the base of the oogonium and measures 18 to 25·5 by 15 to 24 μ; the thick-walled, yellowish-brown oospores ranged from 22·5 to 45 μ in diameter, the average diameter of 50 being 35·3 μ.

The author discusses the taxonomy of the fungus and considers that it falls into Ashby's large-spored sub-group of *Phytophthora parasitica* [*R.A.M.*, vii, p. 601].

Inoculation experiments on seedlings of *J. regia* gave positive results, the fungus being reisolated in pure cultures. Infection of castor seedlings, walnut leaves and fruits, and wounded apple fruits was also obtained by the author.

Wormald (H.). **Bacterial 'blight' of Walnuts in Britain.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 59–70, 1 pl., 1930.

The investigation of the bacterial disease of walnuts (*Juglans regia*), which was first noticed in 1925 at the East Malling Research Station [*R.A.M.*, vi, p. 528], showed it to be caused by an organism closely agreeing in its morphological and cultural characters [a full account of which is given] with Pierce's and Smith's descriptions of *Phytomonas* [*Bacterium*] *juglandis*; its identity with the latter was further proved in parallel tests with a strain of *Bact. juglandis* obtained from California [ibid., viii, p. 550].

At East Malling the disease first appeared in September 1925 on a young tree of the Chaberte variety from a batch of walnut seedlings imported in the spring of that year from France, where,

so far as the author is aware, the disease has not been reported, although the fact that it was found in England during the first season after the tree was planted suggests that the latter was already infected on its reception. A visit during the spring of 1927 by Dufrénoy to the nursery from which the tree originated failed, however, to reveal the existence of the disease there. As first seen at East Malling the disease was only a leaf spot, but in subsequent years lesions were also found on shoots and fruits, isolations from which yielded the organism. In 1927 and 1928, though Chaberte appeared to be the most susceptible, the disease was found attacking a number of other French varieties, among which Mayette and Gladys showed very slight infection.

The pathogenicity of the organism was demonstrated by needle inoculations in 1926 on leaves and shoots of young walnut trees, nearly all of which were successful and yielded the original organism on re-isolation. The first symptoms of infection appeared about three weeks after inoculation. On shoots the dimension of the experimental lesions varied with the thickness of the shoots, and on the leaves every inoculated spot was bordered by a black rim with a yellow zone around it.

MEINECKE (E. P.). **Quaking Aspen: a study in applied forest pathology.**—*U.S. Dept. of Agric. Tech. Bull.* 155, 34 pp., 2 pl., 5 graphs, 1929.

As quaking aspen (*Populus tremuloides*) covers large areas of the national forests in Utah, but is of very little use as timber, the problem has arisen whether it shall be replaced by more promising species or grown for pulp wood. The author accordingly undertook an investigation [full details of which are given] in a representative area near the Great Basin Range Experiment Station, Utah, to determine the present cull per cent. per age class in standing trees and the age after which decay becomes economically important.

P. tremuloides is generally affected by a number of leaf diseases. *Sclerotium bifrons* is at present negligible in Utah, a leaf rust caused by *Melampsora albertensis* is common but does little damage, this also applying to *Uncinula salicis*, while a leaf spot closely related to *Marssonina populi* is exceedingly prevalent.

A common and serious bark canker, the cause of which has not yet been ascertained, sometimes leads to the complete girdling and death of the tree. Typical old cankers present a central dead area surrounded by a series of calluses from which the old rigid bark stands out in ragged fragments. That the disease appears mostly in isolated foci, while adjoining areas remain unaffected, suggests an infectious origin and the possibility of local control by the systematic elimination of cankered trees or branches.

The wood of standing aspen in Utah is attacked by several fungi, principally *Fomes igniarius* [cf. *R.A.M.*, ii, p. 97; ix, p. 432] which causes a typical white rot of the heartwood and later attacks the sapwood and even the cambium. At first brownish streaks appear in the wood, which later becomes white, dry, and very soft. *F. applanatus* [*Ganoderma applanatum*] induces a light-coloured

rot of the heartwood, sometimes extending into the sapwood. As it generally remains confined to the butt of the tree it is seldom of economic importance. In the early stages of the disease the wood shows a characteristic mottling, but is still hard and heavy. The final stage of decay is indicated by the uniform whiteness of the wood, which is then very soft, light in weight, spongy, and brittle. In only two cases were sporophores seen. A type of stringy butt rot confined to the heartwood is also attributed to this fungus. Wood severely decayed by either *F. igniarius* or *G. applanatum* is considered to be unfit for pulping.

Cull is low in the younger trees, but increases with age, slowly at first, until in trees 91 to 100 years old a sudden and marked increase occurs [cf. ibid., viii, p. 540]. In trees above standard a marked increase in cull takes place when they are between the ages of 101 and 110 years. Cull from decay depends largely upon the size and character of the wounds (chiefly fire scars) present, of which about 50 per cent. become infected. The total cull from decay traceable to fire scars amounts to nearly 15 per cent. of the total merchantable volume and represents 68 per cent. of the total loss from gross cull.

The general cull per cent. for the area studied, comprising trees 30 to 130 years old, was 21 per cent., much of which was due to decay caused by *F. igniarius*. In trees 101 to 110 years old the cull was 18·5 per cent., in those aged 111 to 120 years 27·5 per cent., and in those aged 121 to 130 years 45 per cent.

It is recommended that existing stands which are to be offered for sale should be surveyed with regard to age. After the improvement of a given unit through timber sales, and after the establishment of second growth, the elimination of fires will largely contribute to lower the cull percentage due to decay. Finally, infected trees, and those likely to become infected on account of wounds, will have to be eliminated.

On the basis of net volume production and net increment, both the pathological felling age and the pathological rotation lie at about 80 to 90 years. As the silvicultural rotation for pulping will probably be less, it appears likely that quaking aspen can be grown for pulp successfully in the inter-mountain region of Utah.

Chronique forestière. Brunchorstia destruens Erikss. sur Pinus sylvestris L. [Forestry notes. *Brunchorstia destruens* Erikss. on *Pinus sylvestris* L.]—*Bull. Soc. Centr. Forest. Belgique*, xxxvii, 2, p. 91, 1930.

Brunchorstia destruens, recently reported as causing die-back of *Pinus austriaca* in two widely distant localities in Belgium [*R.A.M.*, vii, p. 553], is now stated to have been found on Corsican pines [*P. laricio*] in several places. *P. sylvestris* was also attacked near Louvain.

Hahn (G. G.). **A physiological method of distinguishing Cronartium ribicola and C. occidentale in the uredinial stages.**—*Journ. Agric. Res.*, xl, 2, pp. 105–120, 3 graphs, 1930.

A detailed account is given of greenhouse experiments at Wash-

ington, D.C., in which a number of foreign species and horticultural varieties of *Ribes* were inoculated with the white pine blister rust (*Cronartium ribicola*) and the native piñon (*Pinus edulis* and *P. monophylla*) blister rust (*C. occidentale*) in the author's continued attempt to find a biological method of distinguishing these two rusts in the uredo stage [*R.A.M.*, viii, p. 413]. The great majority of the large number of horticultural varieties of the common garden red and white currants tested, which are grouped together for convenience under the name *R. sativum*, proved to be susceptible to *C. ribicola* [cf. ibid., ix, p. 192] and immune from *C. occidentale*, and extensive trials showed the Fay variety of *R. sativum* (Fay's Prolific) to be the most adaptable and dependable differential host among them. Three varieties in this group, namely, Franco-German, Holland, and Victoria, which were found to be immune from both rusts, may eventually prove to be valuable red currants for growing in areas afforested with white pine, but their immunity from the rusts should first be confirmed by further tests under varying conditions.

C. occidentale produced scant infection on the black currant, which is the most susceptible uredo host of *C. ribicola*, and differed further from the latter in that it infected fully mature leaves in the autumn much more readily than younger ones, whereas the latter are most susceptible to *C. ribicola*. Of the varieties of *R. nigrum* tested, Champion was the most susceptible to *C. occidentale*, while Blacksmith and Boskoop Giant were immune from this rust. Of twelve miscellaneous foreign species of *Ribes* tested, *R. tenue* and *R. fasciculatum* alone proved to be susceptible to *C. ribicola* and immune from *C. occidentale*. These two hosts should be tested further to determine the constancy of their differential behaviour.

The paper terminates with a description of a method for diagnosing unknown uredo material on species of *Ribes* from the Pacific Northwest by greenhouse inoculations on Fay currants, using *R. aureum*, which is susceptible to both the species above mentioned, as a control.

Scheffer (T. C.). **Sterilization of coniferous seed-beds with low-pressure steam.**—*Journ. of Forestry*, xxviii, 1, pp. 42–49, 2 figs., 1930.

A series of experiments was conducted at the University of Washington to test the efficacy of steam sterilization of the soil (a gravelly clay with a very low humus content) in preventing the damping-off disease of the following seedling conifers: western yellow pine (*Pinus ponderosa*), Sitka spruce (*Picea sitchensis*), Port Orford cedar (*Chamaecyparis lawsoniana*), Lebanon cedar (*Cedrus libani*), Deodar cedar (*C.* [*libani* var.] *deodara*), and Atlantic cedar (*C. atlantica*). The treatment was carried out by the inverted pan method [*R.A.M.*, vii, p. 335], using a wooden steam pan, measuring 12 ft. 8 in. by 4 ft. 2 in. by 6 in., with a tin strip round the lower edge and lined with tarred roofing paper. The steam was applied at a very low pressure (6 to 8 lb.), one bed being steamed for two one-hour periods separated by a 24-hour

interval, another treated for one hour, and a third left untreated as a control.

After an hour's steaming the temperature four inches below the surface of the soil was found to be 75° C.

Marked differences in the seedling counts at the end of the season was found in the treated and untreated beds. The number of Douglas fir seedlings remaining in the steamed plots was 18 per cent. greater than in the control, that of western yellow pine 240 to 376 per cent., and that of Sitka spruce 38 to 62 per cent. more. With low pressure steam there is a decided advantage (up to 40 per cent. in the case of western yellow pine) in the intermittent steaming method.

The duration of steaming necessary to kill the following fungi in potato-sugar agar cultures was tested: *Phoma* sp. from the soil in the Sitka spruce plots and from diseased Douglas fir seedlings; *Pestalozzia hartigii* [ibid., vii, p. 287] from diseased western red cedar [*Thuja gigantea*] and Sitka spruce seedlings; *Botrytis cinerea* from diseased western yellow pine seedlings; *Fusarium* sp. from Sitka spruce plots and from diseased Douglas fir and western yellow pine seedlings; *Corticium vagum* [*C. solani*] from *Rhizoctonia* disease of potato; and *Rhizopus nigricans*, *Penicillium glaucum*, and *Aspergillus* sp. from the nursery soil. The organisms (except *C. solani*) were allowed to form spores and then exposed to steam heat at a temperature of 100° C. for varying periods. It was found that in all cases both spores and mycelium were destroyed by five minutes' exposure to steam heat, and it is considered probable that at any rate partial sterilization of the soil can be effected by maintaining a temperature of about 70° for a few minutes to a depth of at least four inches.

KAMEI (S.). **On the life-history of Uredinopsis pteridis, with a special bearing on its peridermial stage.**—*Ann. Phytopath. Soc. Japan*, ii, 3, pp. 207–228, 1 pl., 1930. [Japanese, with English summary.]

The writer's investigations have shown that the teleutospores of *Uredinopsis pteridis* on Japanese bracken (*Pteridium aquilinum* var. *japonicum*), collected near Sapporo, Japan, can survive the winter and germinate in the spring, infecting the young needles of *Abies mayriana* [cf. *R.A.M.*, iii, p. 114]. The peridermial stage developed about a month after inoculation. The aecidiospores obtained from *A. mayriana* infected *P. aquilinum* var. *japonicum*, on which uredospores similar to those occurring in nature were produced.

The author expresses doubts regarding the correctness of the life-cycle reported in the western United States for *U. pteridis*, in which the peridermial stage was identified by Jackson (*Brooklyn Bot. Gard. Mem.*, 1, p. 218, 1918) with *Peridermium pseudobalsameum*, appearing always on the second year needles of *A. grandis*, *A. nobilis*, and *A. amabilis*, since he found in repeated inoculation tests that this stage developed on the current season's needles of *A. mayriana* together with lens-shaped pycnidia. A description is given of the pycnidial and aecidial stages on this host.

Fischer (E.). **Über das Ergebnis eines Infektionsversuches mit dem mediterranen Gymnosporangium gracile.** [On the outcome of an inoculation experiment with the Mediterranean *Gymnosporangium gracile*.]—*Mitt. Naturforsch. Gesellsch. Bern, 1929*, p. xxxii, 1930.

Gymnosporangium gracile, closely related to *G. clavariaeforme* and occurring on the same host (*Juniperus oxycedrus*) [*R.A.M.*, vii, p. 416], may be distinguished by the fact that its teleutospore stage causes the development of witches' brooms. The hitherto unknown aecidial stage of the rust developed on *Crataegus* [? *oxyacantha*] and *Cydonia maliformis* inoculated with its teleutospores. The structure of the peridial cells is very similar in the aecidia of *G. gracile* and *G. clavariaeforme*, and in fact the sole morphological difference between the two species is the smaller and narrower shape of the teleutosori and teleutospores in the former. However, the effects produced by these two species on their hosts are widely divergent.

Hino (I.) & Katô (H.). **Notes on the 'bukuryô', sclerotia of Pachyma hoelen, Rumph.**—*Bull. Miyazaki Coll. of Agric. and Forestry, 1930*, 2, pp. 77–91, 3 pl., 1930.

In this paper the authors present their observations on the 'bukuryô', or sclerotia of *Pachyma hoelen*, much used as a medicine in China and Japan and thought to be probably identical with the Indian bread or tuckahoe (*Pachyma* or *Poria cocos*) [*R.A.M.*, viii, p. 813]. The fungus appears to be a weak parasite, causing a white rot of the roots and decay of the rootlets of *Pinus thunbergii*, *P. densiflora*, and mulberry trees near Miyazaki, Japan. The sclerotia begin to form between the bark layers and ultimately reach an average size of a goose's egg, though some are much larger.

Clayton (E. E.). **A study of the mosaic disease of crucifers.**—*Journ. Agric. Res.*, xl, 3, pp. 263–270, 1 pl., 1 fig., 1930.

The results of an investigation started in 1923 [brief details of which are given] indicate that the mosaic disease which occurs on swede turnips (*Brassica napobrassica*) on Long Island, New York, is not likely to become a serious trouble to the more important cabbage, cauliflower, and Brussels sprouts crop. Inoculation experiments by means of the cabbage aphid (*Brevicoryne brassicae*) and by hand showed that cauliflower and Brussels sprouts, although susceptible, are not easily infected, while cabbage was either highly resistant or immune. There was some field evidence, however, that cabbage may serve as a carrier of the disease. Among the other cruciferous hosts tested, Chinese cabbage (*B. chinensis*), the cultivated white and the wild black mustards (*B. alba* and *B. nigra*), turnips, and rape (*B. napus*) were found to be susceptible. The symptoms varied widely on the different hosts, and also with environmental conditions, among which temperature appears to play an important part. While at 70° to 80° F. the symptoms were usually severe, at 55° to 65° even the more susceptible hosts made a fair development, and diseased Brussels sprouts and cauli-

flowers entirely recovered. The investigation also showed that the swede mosaic is not carried in the seed, and does not affect the yield or appearance of the latter.

HIURA (M.). **Biologic forms of Albugo candida (Pers.) Kuntze on some cruciferous plants.**—*Japanese Journ. of Botany*, v, 1, pp. 1–20, 1930.

In connexion with a study of the biological forms of *Albugo candida* [*Cystopus candidus*: *R.A.M.*, vii, p. 100], the strains occurring on radish, *Brassica campestris* subsp. *chinensis*, and Chinese mustard (*B. juncea*) were inoculated into a number of cruciferous plants.

The results of the experiments [which are discussed and tabulated] showed that the radish strain is capable of infecting all the varieties of radish tested, but none of the other plants. The strain from *B. campestris* var. *chinensis* infected pot-herb mustard (*B. japonica*), *B. campestris* subsp. *chinensis* var. *komatsuna*, turnip, *B. campestris* subsp. *chinensis* var. *amplexicaule*, *B. pekinensis*, *B. juncea*, and its original host with varying degrees of severity, but none of the other crucifers. The strain from *B. juncea* was found to be capable of attacking *B. cernua*, *B. campestris* subsp. *chinensis*, and its own host with more or less severity, but failed to infect radish. It would appear, therefore, that these three strains represent distinct biological forms of *C. candidus*.

No marked differences in conidial dimensions were detected in these three biological forms, but the strain parasitic on shepherd's purse (*Capsella bursa-pastoris* var. *auriculata*) was characterized by smaller conidia than the others (mostly 16 by 14 μ, compared with 18 to 20 by 16 μ).

The incubation period of *C. candidus* was found to range from 7 to 10 days, being 1 to 2 days longer in the less than in the more susceptible hosts.

MUMFORD (E. P.). **On the curly top disease of the Sugar Beet: a biochemical and histological study. Summary of results.**—*Ann. of Appl. Biol.*, xvii, 1, pp. 28–35, 2 pl., 1930.

The work summarized in this paper was done for the purpose of determining the nature of the resistance exhibited by some strains of sugar beet to curly top [*R.A.M.*, ix, p. 282]. The results of the experiments with a markedly resistant (51/25-3/23-P19) and a markedly susceptible (Tracy 2769–24) pedigree strain indicated that the sap from the former, as compared with that from the latter, was more concentrated in electrolytes and less concentrated in total solids and non-electrolytes. With one exception, there was a slight but general tendency towards greater acidity in the leaves of the resistant than of the susceptible strain. A fundamental difference between the two strains was that, in the susceptible one, curly top increased the quantity of sugars in the leaves and reduced it in the roots, whereas in the resistant strain the disease decreased the quantity of sugars in both leaves and roots. This fact suggests that the non-occurrence of severe curly top in the resistant strain may possibly be connected with the

lowering of the sugar content of the exposed parts of the plants which, in this strain, accompanies the onset of the disease and renders the plant a less favourable host for the insect vector of the disease (*Eutettix tenella*). A further suggestion is that the excessive accumulation of sugars in the leaves of diseased plants of the susceptible variety may be correlated with phloem necrosis, which is characteristic of curly top.

Histological examination showed that in the young and old leaves of healthy plants, the cuticle and epidermis are invariably thicker over the palisade tissue and the veins in the resistant than in the susceptible strain.

Swezy (Olive) & Severin (H. H. P.). **A Rickettsia-like micro-organism in Eutettix tenellus (Baker), the carrier of curly top of Sugar Beets.**—*Phytopath.*, xx, 2, pp. 169–178, 2 figs., 1930.

An account is given of the writers' filtration experiments, conducted by similar methods to those described in a former study [*R.A.M.*, viii, p. 83] on *Eutettix tenella* and sugar beets affected by curly top. The intestinal canal of the leafhopper was often found to contain immense numbers of micro-organisms, occurring in the greatest profusion in the lumen of the mid-intestine, though a few could also be detected in the oesophagus. The bacilli were also found as intracellular parasites in the wall of the stomach and elsewhere, and in the blood. Both infective and non-infective insects were found to harbour these micro-organisms, but they were present in a higher percentage of the former than of the latter (69·5 compared with 41·4 per cent., in the intestinal tract). The organisms are diplobacillary in form, with somewhat rounded ends, ranging from 0·24 to 3 μ in length; some individuals stain clearly with iron haematoxylin or Giemsa while others take no stain.

In cultures of filtrates from *E. tenella* (macerations of the entire insect, the intestinal canal, and the salivary glands) two types of organism predominated, one diplobacillary and the other very short, almost diplococcoid, with intermediate forms between the two. A few cultures showed a giant diplobacillary form, which was later found also in cultures heated at 70° C. for ten minutes in hermetically sealed glass tubes, and is tentatively regarded as a developmental form of the smaller diplobacillary organism. Both the diplobacillary and diplococcoid organisms were found in the same cultures. Similar organisms occurred also in the filtrates of diseased sugar beets kept (*a*) at room temperature, and (*b*) from 65° to 70°, but not above this point. Smears made from the filtrates immediately after filtration showed no visible organisms.

Oberdorfer. **Trockenbeizversuch gegen den Wurzelbrand der Zuckerrübe.** [Dusting experiment against root rot of the Sugar Beet.]—*Nachricht. über Schädlingsbekämpf.*, v, 1, pp. 35–36, 1930.

Fairly good control of root rot of sugar beets [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*] was given in a recent test in Saxony by dusting the seed-clusters with ceresan,

which reduced the incidence of infection from 90 to 52·5 per cent. The corresponding figure in the plot treated with tillantin was 59·3 per cent.

Otto (W.). **Beizversuche zu Zucker- und Futterrüben im Versuchsring Gera.** [Disinfection tests on Sugar and Fodder Beets in the Gera experimental circle.]—*Nachricht. über Schädlingsbekämpf.*, v, 1, pp. 36–38, 1930.

Very good control of root rot of sugar and fodder beets [*Phoma betae, Pythium de Baryanum*, and *Aphanomyces levis*] was given in 1927 in the Gera district [Thuringia] by dusting the seed with tillantin [see preceding abstract].

Larmer (F. G.) & Coons (G. H.). **The physiology and variations of Cercospora beticola in pure culture.**—*Papers Michigan Acad. of Science, Arts and Letters, 1929*, xi, pp. 75–104, 3 pl., 1930.

The conidiophores of *Cercospora beticola* on beet leaves are normally short and non-septate, but the older ones may be elongated (up to 180 μ) and septate. In culture the younger conidiophores are short, simple, and non-septate, arising directly from a submerged filament. At the apical end there is a distinct circular scar, indicating the point of attachment of the spore. Older conidiophores become longer, develop septa, and may have several of these scars along the sides, with a geniculation at each. Abnormal conidia, varying from structures consisting of one or two cells to extremely long, multiseptate, hypha-like filaments, are sometimes produced. The conidia in normal cultures measured 55 to 260 μ in length (average 140 μ), the average number of septa being 10·8. *C. beticola* grows well between 20° and 30° C., the optimum being 24° to 26°. Conidia were produced over a temperature range of 17° to 29°, most freely about 24°. Short robust spores with few septa were characteristic of growth at 17° to 18°, and long ones (often more than 260 μ) at 27° to 29°.

Evidence was obtained that conidial production in culture is a response to a food stimulus, influenced to some extent by other factors such as humidity, light, and temperature. Zonation was induced by fluctuating temperature and light; blue light was comparable in its effects to natural diffused daylight, but red filters appeared to screen the rays that induced zonation.

A study of the variant forms of the fungus which appeared in the authors' cultures showed that they differed from the parental not only in the colour but also in the rate of growth of the submerged mycelium. Of 23 single-spored isolations studied, 15 gave one or more variant forms. The oldest variant was kept through 20 transfers on artificial media for 15 months. The aberrant characters can be modified but not permanently changed by growing the variant on a medium different from that in which it originated. Inoculation experiments demonstrated that there is a tendency for restoration to the normal form, on the host, that the greater the variation the greater is the change towards the normal, and that the origin of the aberrant forms may possibly be due to malnutrition, as the sugar beet is the natural medium for the

growth of the fungus. Attempts to produce aberrant forms in normal cultures by wounding, exposure to illuminating gas, freezing, and chemical poisoning gave negative results.

Several instances were observed of apparent reversion, always as normal sectors in the aberrant form, which differed from the variant in the colour of the colony, amount and density of the aerial mycelium, and spore production.

WERNECK (H. L.). **Die Blattfleckenkrankheit (Cercospora beticola Sacc.) auf Zucker- und Futterrüben in Oberösterreich.** [The leaf spot disease (*Cercospora beticola* Sacc.) on Sugar and Fodder Beets in Upper Austria.]—*Mitt. Landw.-Chem. Bundesversuchsanst. Linz, 1929*, 3 pp., 1929. [Abs. in *Bot. Centralbl.*, N.F., xvi, 9–10, p. 312, 1930.]

Leaf spot of beets (*Cercospora beticola*) [*R.A.M.*, ix, p. 283] is stated to have assumed epidemic proportions in Upper Austria, especially on the sugar-yielding varieties in localities up to 400 m. above sea level. The disease is attributed to potash deficiency and the prevalence of a shallow surface soil overlying an infertile subsoil. Control measures should include the use of healthy seed, destruction of diseased leaves after the harvest, and spraying with 1·5 to 2 per cent. Bordeaux mixture.

GABOTTO (L.) & FRAIPONT (F.). **I risultati della lotta contro la Cercospora della Bietola da zucchero ottenuti nell' Alessandrino durante la campagna 1929.** [The results of the campaign against the *Cercospora* of the Sugar Beet obtained near Alessandria during the operations of 1929.]—*Indus. Succ. Ital.*, xxiii, 3, pp. 110–115, 1930.

Most encouraging results were given in three sugar beet fields of the Alessandria [Piedmont] district during 1929 by the application of 10 per cent. 'protector ramato' [*R.A.M.*, viii, pp. 8, 9] for the control of leaf spot (*Cercospora*) [*beticola*]. The value of the total extra yield accruing from the treatment is estimated at L. 1,457 per hect., and the expense of 15 applications of the fungicide at L. 352, giving a net profit of L. 1,105 per hect.

DE LA LOMA (J. L.). **Cercospora in Spain.**—*La Hacienda*, xxv, pp. 173–174, 1930. [Abs. in *Facts about Sugar*, xxv, p. 423, 1930.]

Very favourable results were obtained in 28 Spanish beet fields during 1928–9 by spraying the leaves against *Cercospora* [*beticola*] with 2 per cent. Bordeaux mixture [*R.A.M.*, ix, p. 154]. The number of applications ranged from two to seven, and the maximum effect was a difference of 2·20 per cent. in the sugar content of the beets and an average difference of 9·49 metric tons of beets per acre. No indication of resistance to the disease was observed in a large number of commercial varieties tested.

BRYAN (MARY K.). **Bacterial leaf spot of Squash.**—*Journ. Agric. Res.*, xl, 4, pp. 385–391, 3 pl., 3 figs., 1930.

This is a full account of the Hubbard squash (*Cucurbita maxima*) leaf spot caused by *Bacterium cucurbitae* which was first recorded

in New York in 1925 [*R.A.M.*, v, p. 465], since when it has also been found attacking summer and winter squashes and pumpkins (*C. pepo*) in Maryland, the District of Columbia, Georgia, and South Carolina. The lesions, which are mainly confined to the leaves, at first appear on the lower surface as minute water-soaked areas, penetrating to the upper surface as indefinite yellow areas; they enlarge rapidly to form definite round or angular, thin, brown, translucent spots with a wide, bright yellow halo on the upper surface and either a water-soaked margin or no apparent differentiation on the lower side. The spots are restricted by the veins but may reach 6 or 7 mm. in diameter. Eventually large dead areas are produced by coalescence, but the dead tissues do not tear and drop out. Occasionally young stems of summer squashes may also be attacked, and very young plants may be killed by injury to the growing point when thus infected. The bacteria were shown to enter through the stomata.

The causal organism [the cultural characters and a technical description of which are given] is a short rod, 0·5 to 1·3 by 0·45 to 0·6 μ in diameter, with one polar flagellum, occurring singly, in pairs, or in short chains, Gram-negative, not acid-fast, and not producing spores. On beef agar the colonies are round, yellow, and opalescent with internal striae. Growth is best at P_H 6·5 and at 25° to 30° C., and the thermal death point is 49°.

The bacterium was successfully inoculated into watermelon, and *C. moschata*, but the disease has not yet been recorded on these hosts in the field. Cucumbers and muskmelons are apparently immune. There was evidence that the bacterium is seed borne, but it does not appear capable of living in the soil, or of being transmitted by insects. Spread in the field is chiefly by rain.

NAKATA (K.). **Comparative studies of Bact. sesami with Bact. solanacearum and Bact. sesamicola.**—*Ann. Phytopath. Soc. Japan*, ii, 3, pp. 229–243, 1 pl., 1930. [Japanese, with English summary.]

An investigation was made of the relationships between three bacteria recorded as the causal organisms of sesame diseases, viz., *Bacterium sesami* [cf. *R.A.M.*, v, p. 519], *Bact. solanacearum*, and *Bact. sesamicola*. The results of comparative studies of the morphology, cultural characters, and physiological features of the three bacteria indicated that *Bact. sesami* and *Bact. sesamicola* are identical, but are distinct from *Bact. solanacearum*. The correct name of the former is considered to be *Bact. sesami* Malkoff, syns. *Ps*[*eudomonas*] *sesami* Malk., *Bact. sesamicola* Takimoto. It is a longish rod occurring singly or in pairs, 1·2 to 3·8 by 0·6 to 0·8 μ when stained, with two to five polar flagella, no spores or capsules, Gram-negative. On beef broth *Bact. sesami* grows rapidly almost without pellicle, does not coagulate milk, turns litmus milk blue and potato media slightly brown, and liquefies gelatine promptly. On beef agar plates the colonies are circular, flat, striate, smooth, or umbonate with entire margins, assuming a white and opalescent lustre. On beef agar stroke or slab the growth is filiform, white, and translucent with butyrous consistency. The organism is aerobic; no gas is formed in sugar media; methylene blue is re-

duced but not nitrates; no hydrogen sulphide or indol is produced. The optimum temperature for growth is 30° C., minimum 0°, maximum 35°, and thermal death point about 49°. The group number is *Bact.* 221·2332433.

Bact. sesami causes the formation of dark brown spots on sesame leaves and stems in Bulgaria, India, Japan, and Korea.

Ravaz (L.) & Branas (M.). **Sur un cas spécial de court-noué.** [A special form of court-noué.]—*Prog. Agric. et Vitic.*, xciii, 3, pp. 53–60, 5 figs., 1930.

The authors give a brief description of a peculiar form of court-noué observed in a vineyard of the School of Viticulture [Montpellier] and over a large area in the valley of the Orb (Hérault), and which differs from the usual form of the disease occurring in moist soil. The diseased stocks present large lateral lesions, occasionally extending over more than half the circumference of the stock and corresponding to branches removed by pruning. The new shoots which are formed in the spring on these stocks show symptoms of court-noué in some part of their length, but do not grow in the usual zig-zag fashion. Secondary, more or less developed branches appear on four or five consecutive nodes of the vines, this giving the latter a bushy appearance. The leaves differ from the normal in the acuteness and narrowness of their teeth and in a minutely reticulate corrugation of their upper surface. This form presents striking points of similarity with that described in a recent paper by Rives [*R.A.M.*, ix, p. 504] from a vineyard situated on very dry soil; in this case also the diseased stocks bore extensive lesions caused by excessive pruning of lateral branches, and in some all the woody tissues had rotted away.

In the vineyard of the School of Viticulture most of the stocks presenting this condition recovered to a great extent; the secondary branching decreased, the teeth of the new leaves were broader, and the grapes set normally, but it still remains to be seen whether this recovery is lasting. In hereditary court-noué no cases of spontaneous recovery have ever been recorded. [This paper is also printed in *Ann. École Nat. d'Agric. Montpellier*, xx, 2, pp. 63–71, 1930.]

Viala (P.). **Les matières colorantes contre le mildiou et l'Oïdium.** [Colouring matters for the control of mildew and *Oidium*.]—*Rev. de Vitic.*, lxxii, 1855, pp. 41–43, 1930.

This is a reproduction *in extenso* of the author's paper under the same title which has already been noticed from another source [*R.A.M.*, ix, p. 327], and which discusses the value of organic dyes in the treatment of downy mildew and *Oidium* of the vine [*Plasmopara viticola* and *Uncinula necator*].

Borg (P.). **Appendix F. Report of the Plant Pathologist.**—*Repts. on the Working of (Malta) Govt. Depts. during the financial year 1928–29*, pp. T. 12–T 15, 1930.

There was a great reduction in the importation into Malta of citrus fruit from Sicily during the period under review as compared with previous years, mainly due to the Italian Government regula-

tions (20th April 1928) enforcing certain fixed standards of quality and freedom from disease in fruit destined for export.

Great difficulty was experienced in spraying the winter potato crop against blight (*Phytophthora infestans*) owing to adverse weather conditions, and the disease also appeared on the spring crop [*R.A.M.*, ix, p. 158]. Regular treatments were carried out under departmental supervision. Gallipoli cotton, a variety of *Gossypium hirsutum*, has practically superseded the old local form, *G. herbaceum*, which is susceptible to wilt (*Fusarium vasinfectum*) [ibid., ix, p. 378], especially on clayey and impermeable soils.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1926. [Diseases and pests of cultivated plants in the year 1926.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 40, 159 pp., 1 graph, 26 maps, 1930.

This report is prepared on similar lines to those adopted in earlier reports, Dr. H. Pape being mainly responsible for the sections on the fungous, bacterial, and physiological diseases, while Dr. O. Schlumberger supplies the information on potato wart (*Synchytrium endobioticum*). The distribution in Germany of the following diseases is shown by means of maps: yellow and black rust of cereals (*Puccinia glumarum* and *P. graminis*), wheat bunt (*Tilletia tritici*) [*T. caries*], loose smuts of oats, barley, and wheat (*Ustilago avenae*, *U. nuda*, and *U. tritici*), soil acidity diseases of cereals, and blackleg and late blight of potatoes (*Bacillus phytophthorus* and *Phytophthora infestans*).

A year's progress in solving farm problems of Illinois 1928–29. —*Forty-second Ann. Rept. Illinois Agric. Exper. Stat. for year ended June 30, 1929*, 270 pp., 29 figs., 4 diags., 10 graphs, 4 maps, 1929. [Received July 1930.]

The following references of phytopathological interest, other than those already noticed from different sources, occur in this report. Selection for resistance of maize to scutellum rot [*R.A.M.*, viii, p. 292], based mainly on the physical characters of the ears, has been very successful, the yields from such ears being only 4 per cent. lower than those given by nearly disease-free seed. In some cases it has been possible to control the black bundle disease of maize (*Cephalosporium acremonium*) by seed selection, whereas under other conditions this method was a failure, indicating that infection may occur through the soil. During the last two years the losses from *Basisporium* [*gallarum*: *Nigrospora sphaerica*: loc. cit.] -infected maize seed have been much heavier on more productive soil than on poor land. Where good seed yielded 66 bushels per acre *Nigrospora*-infected seed gave 7 bushels less, but where good seed only yielded 23 bushels the disease caused no reduction. It was found that open-pollinated strains of maize, carefully selected over a period of years, suffer less from ear rots [chiefly due to *Diplodia zeae*, *N. sphaerica*, *Gibberella saubinetii*, and *G. moniliformis*: ibid., ix, p. 374] than average unselected seed. Generally speaking, the incidence of ear rot is lower in early- than in late-planted maize, and in maize crops preceded by

a legume than in maize following maize. Seed treatment was also effective in increasing the yield and slightly reducing ear rots.

The results of experiments in apple scab [*Venturia inaequalis*] control showed that sulphur dusts are useless for this purpose, even in mild infection, except possibly as a supplementary measure late in the season; that wettable sulphurs containing 4 to 6 lb. sulphur per 50 galls. water will give adequate commercial control; but that lime-sulphur is the sole preparation tested that can be guaranteed to give a high percentage of clean fruit. By-product sulphur from artificial gas plants was extensively tested with promising results; this substance can be obtained at a low cost and may well prove valuable in the development of an effective new type of sulphur sprays. The addition of potassium permanganate and other oxidizing agents to sulphurs increased the efficiency of the latter, but the cost of these materials is too high to justify their use.

Apple measles [ibid., viii, p. 157] is known to be spreading and appears in some cases to originate in the nursery. The disease is mainly confined to the Delicious and Starking varieties.

Bacterial spot of peach [*Bacterium pruni*: ibid., viii, p. 727] was unusually prevalent during 1928. Sulphur dusts completely failed to control the disease, but certain combinations of cresylic acid and lime, applied at frequent intervals between petal fall and three weeks before harvest, reduced the amount of infection by 30 to 40 per cent. Even better results were obtained with certain organic mercury compounds, while methyl violet dye also gave fair control. The fruit of the Gage Elberta variety is decidedly resistant to *Bact. pruni*, and the leaves, though heavily infected, are not shed as quickly as those of Elberta and J. H. Hale.

Blackberry anthracnose [*Plectodiscella veneta*] may be economically controlled by one application (delayed dormant) of lime-sulphur with kayso.

ADAMS (J. F.). **Report of the Plant Pathologist for 1929.**—*Quart. Bull. State Board of Agric., Delaware*, xx, 1, 26 pp., 2 pl., 1930.

Notes are given on numerous diseases of plants observed in Delaware during 1929 [cf. *R.A.M.*, viii, p. 487].

Fireblight of apple and pear (*Bacillus amylovorus*) was more prevalent than before, and there was an increase in the prevalence of peach yellows for the first time since 1920. Lettuce was observed, for the first time in the State, to be affected by yellows [ibid., viii, p. 634]. A severe outbreak of bacterial blight (*Bact. vesicatorium*) of pepper [*Capsicum annuum*] also occurred for the first time, and was especially prevalent in plantings where rotation had not been practised.

MCKINNEY (H. H.). **A mosaic of Wheat transmissible to all cereal species in the tribe Hordeae.**—*Journ. Agric. Res.*, xl, 6, pp. 547–556, 3 pl., 1930.

In continuation of his study of the mosaic disease of winter wheat and winter rye [*R.A.M.*, v, p. 85; vii, p. 232], the author gives brief details of infection experiments which showed that the

disease is transmissible through soil to the following species of the tribe *Hordeae*: *Triticum vulgare*, *T. compactum*, *T. turgidum*, *T. durum*, *T. dicoccum*, *T. spelta*, *T. polonicum*, *T. monococcum*, *Hordeum sativum*, and *Secale cereale*. In the forms with spring-growth habit the disease only developed appreciably when they were sown in the autumn, and all susceptible species gave indications of including resistant strains. Typical mosaic rosette was found in a limited number of varieties of winter common wheat (*T. vulgare*), but some strains were selected that developed 100 per cent. rosette. Both green and yellow types of mottling occurred on the susceptible cereals, but the green type was the most common. Yellow streaks, stripes, and blotches were prevalent in Red Winter spelt and in certain selections of Currell, Illini Chief, Mediterranean, and Goens common wheats, and yellow banding was observed on Polish wheat. By continuous selection lines were isolated which developed a large percentage of the green type, and others with a high percentage of the yellow type of mosaic, which caused the plants to become dwarfed late in the spring, and to produce shrivelled and practically valueless grain.

Mottled leaves with yellow mosaic showed very few, or no cell inclusions which, on the other hand, were abundant in those of green mosaic. A green mosaic without cell inclusions was observed on wheat in Nebraska; another, on the same host in Maryland, was associated with cell inclusions which differed in certain characters from those usually found.

The varied expressions of mosaic, rosette, and dwarfing depend to a large extent on the genetic purity of the host plants. Long continued selection to secure botanically and agronomically homozygous wheat varieties does not appear to be a guarantee of homozygosity for the factors determining resistance or susceptibility to mosaic and rosette. The latter has never been observed independently of the former, and all the evidence at hand indicates that rosette is a phase of the mosaic disease.

Vanterpool (T. C.) & Ledingham (G. A.). **Studies on 'browning' root rot of cereals. I. The association of Lagena radicicola n. gen., n. sp., with root injury of Wheat.**— *Canadian Journ. of Res.*, ii, 3, pp. 171–194, 2 pl., 7 figs., 1930.

A description is given of a root rot of wheat which is widespread throughout Saskatchewan, where it first attracted attention in 1917 and has since become of considerable economic importance; in 1929 it was definitely ascertained that oats and barley are also susceptible to this disease in the field. On wheat the first symptoms usually appear early in June, the outbreak being most marked and sudden in seasons with a cold, wet spring followed by an abrupt spell of drought and warmer weather, when patches of the crop turn yellow and then brown, for which reason the disease is locally know as 'browning' root rot. The plants are not killed outright, but usually recover and may give a fair yield when the remainder of the growing season is favourable, rainfall tending to mask the symptoms. Ordinarily, however, the affected plants are reduced to one or two tillers, and are stunted and late in maturing. The majority of the root tips in such plants are brown

and necrotic, and not infrequently brown lesions are scattered along the main roots. The whole root system is thin and poorly supplied with thin laterals and root hairs. Brown, smooth-walled, single or aggregated oospores are invariably present in the cortical and epidermal cells of the necrotic root tips and root hairs, and not uncommonly also in the vascular bundles. There is no hypertrophy of the host tissue.

Preliminary isolations from diseased wheat roots yielded a number of species of fungi, including *Fusarium*, *Pythium*, and *Helminthosporium*, but inoculation experiments showed that, under the conditions of the experiments, the forms first isolated were not the cause of the disease. In subsequent studies in 1929 [full details of which are given], when wheat plants were grown in clay soil from infected fields of southern Saskatchewan, a fungus, hitherto not described, belonging to the lower Phycomycetes was found to be associated with the root rot, though it is not believed to be the organism chiefly responsible for the disease. It is characterized by a complete absence of mycelium, and consists of a thallus developing in the cortical, epidermal, and root hair cells of the finer roots. The thallus is coenocytic, sac-shaped, sometimes curved, occasionally elongate-globulate, and with thin walls, attached to the host cell-wall by a collar which, in surface view, appears as two concentric circles. Mature thalli occur singly or aggregated in the host cell, and vary considerably in size, according to their number, averaging 14 by 35 μ; they may function either as zoosporangia or coenogametangia. In the former case the zoosporangium discharges its contents extramatrically through a single emission tube (4 μ wide by 10 to 15 μ long) into a vesicle where the zoospores (from a few to over 50) are formed and liberated. The zoospores are bean-shaped, with two lateral flagella, about 11 by 7 μ in diameter when motile and 6 μ when at rest. In the second case the male thallus conjugates with the female by means of a tube, the resulting oospore being smooth, double-walled, sub-spherical, and from 10 to 25 μ in diameter. Infection of the host is ensured by the extramatrically discharged zoospores which round up on the surface of the host rootlets and penetrate by means of a germ-tube. Germination of the oospores was not observed.

In discussing the systematic position of the fungus, the authors consider it to belong to the Ancylistaceae, close to the genus *Lagenidium*, from which it differs, however, in being apparently always dioecious and parasitic in the roots of phanerogams. For this reason the new genus *Lagena* is established and the organism is named *L. radicicola*. English diagnoses of the genus and species are appended.

In the authors' experiments the fungus caused a root rot in wheat, barley, rye, and maize seedlings, but it has not been recorded on the last two cereals in nature. It is believed to be an obligate parasite which, under certain conditions, is capable of causing definite injury to wheat in areas where it is common.

The preliminary results of further investigations indicate that the 'browning' disease described above belongs to the *Pythium* root rot type of disease, since several 'isolation strains' of Pythia-

ceous fungi have been obtained from infected roots of wheat seedlings grown in soil from infected fields, and these were shown to be definitely parasitic on the roots of wheat.

ROUSSAKOFF (L. F.). Особенности эпидемии ржавчины хлебов в районе Приморской Областной Сельско-Хозяйственной Станции в **1926** году. [Peculiarities of the cereal rust epidemic observed at the Littoral Province Agricultural Experiment Station in 1926.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 5–6, pp. 695–718, 3 figs., 1930.

This is a detailed account of the author's study of the development and incidence in 1926 of cereal rusts, with particular reference to stem rust (*Puccinia graminis tritici*) of wheat, at the Pacific Littoral Agricultural Experiment Station. All the information contained in it has already been noticed from former papers [*R.A.M.*, vii, pp. 232, 233; viii, p. 362].

MAINS (E. B.). **Effect of leaf rust (Puccinia triticina Eriks.) on yield of Wheat.**—*Journ. Agric. Res.*, xl, 5, pp. 417–446, 6 figs., 1930.

This is a report on the results obtained in an investigation started in 1918 of the prevalence and economic importance of wheat leaf rust (*Puccinia triticina*) in the United States, and of experiments from 1921 to date to determine its effect on the yield and quality of the grain. In greenhouse trials of susceptible varieties, plants of Mediterranean and Red Fern wheat, moderately infected from tillering to maturity, yielded 63·3 and 57·2 per cent., respectively, less than the controls. In Fulcaster, heavy infection from tillering, from shooting, and from the stage when the ears were just showing, to maturity resulted in the reduction of yield by 97·4, 91·3, and 54·3 per cent., respectively, while plants severely rusted from blossoming to maturity had their yield reduced by 27·2 per cent. Heavy infection of Michigan Amber at the time the ears were emerging from the sheath resulted in a reduction of 37·2 per cent., and at blossoming of 27·2 per cent. in one case and of 33·5 per cent. in another. Webster, a variety highly resistant to physiological form 5 of the rust, used in the experiments, produced 11·4 per cent. less than the controls when it was abundantly infected during emergence of the ears from the sheath.

The leaves of rusted plants died earlier than the corresponding leaves of the controls, and the yield in straw was reduced by 11 to 70 per cent. or more, according to the date of infection; in Michigan Amber there was a suggestion that the rust caused a shortage of carbohydrates in the straw, since in infected plants it remained yellow instead of turning purple.

The reduction in yield of grain by the rust is due to the production of fewer and lighter grains. The reduction in number affects chiefly the late flowers of the ear, namely, those of the upper and lower spikelets and the upper flowers in the central spikelets. Severe infection over long periods resulted in marked reduction

both in the number and in the weight and size of the grains, while infection over shorter periods was largely limited to decreasing the weight of the grains.

Field experiments indicated that dusting with sulphur considerably reduced the damage done by the rust. Thus, in a field of the winter wheat Trumbull, which was heavily rusted immediately after blossoming, undusted lots produced 11·1 per cent. less than the dusted plots. Undusted plots of the spring wheat, Illinois No. 1, rusted at the same stage, yielded 24·2 per cent. less than the dusted. It was also observed that severe infection with *P. triticina* early in the autumn may considerably increase the susceptibility of wheat to winter injury.

A survey of the incidence of leaf rust throughout the wheat-growing areas of the United States from 1917 to date [the results of which are given in a table] indicates that this rust is usually prevalent in the regions where soft winter wheats are extensively cultivated, and that in most years it is of considerable economic importance there.

NIEVES (R.). **Contribución al conocimiento de la 'caries' del Trigo (Tilletia spp.). Sus caracteres biológicos—su comportamiento genético—bases para la creación de variedades resistentes.** [Contribution to the knowledge of the 'bunt' of Wheat (*Tilletia* spp.). Its biological characters—its genetic behaviour—bases for the development of resistant varieties.] —*Bol. Min. Agric. Nac.*, Buenos Aires, xxix, 1, pp. 97–112, 1930.

In connexion with a general discussion on the biology of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], the writer refers to a series of hybridization and varietal reaction experiments which have been proceeding since 1927 at the Guatraché (Pampa Central) Experiment Station of the Argentine Republic. The analysis of the mode of inheritance of resistance to bunt and other characters is still in progress, but some data are available regarding varietal reaction. In general, the wheats with 14 chromosome pairs (*Triticum durum*, *T. persicum*, and *T. turgidum*) proved more resistant than those with 21 (*T. vulgare*) [*R.A.M.*, iii, p. 201; ix, p. 368]; among the latter the spring wheats were less susceptible than the winter ones, but no case of absolute immunity was observed [cf. ibid., vi, p. 660]. The largest number of highly resistant new strains of *T. vulgare* were derived from a sub-group of winter wheats showing great capacity for withstanding cold and drought (*T. vulgare* v. *erythrospermum*), the average resistance of which is stated to surpass that of Florence.

The south-eastern regions of La Pampa, like those of the Crimea (the home of the most resistant wheats), are stated to be particularly well adapted, as regards climate and soil, to the development of bunt on the winter varieties, and it is suggested that the most highly resistant strains are likely to be found among the indigenous wheats in districts where environmental conditions are propitious to infection.

Kühl (R.). **Beiträge zur Frage des Keimverhaltens der Steinbrandsporen nach Anwendung verschiedener Mengen von Trockenbeizmitteln.** [Contributions to the question of the germinability of bunt spores after the application of varying quantities of dusts.]—*Angew. Bot.*, xii, 2, pp. 162–169, 1930.

The germinability of the spores of wheat bunt (*Tilletia tritici*) [*T. caries*] after the treatment of the seed-grain with various dusts was tested by the so-called 'Brunswick method' as follows [cf. *R.A.M.*, ix, p. 169]. The inoculated and treated seed-grain was sown in boxes at a depth of 2 cm. and at the rate of 100 seeds per 300 sq. cm., the temperature being maintained at 15° to 20° C. Counts were made after 5, 7, and 10 days. The boxes were filled with (1) ordinary garden soil, (2) sandy field soil, and (3) clayey field soil. The results of the experiments [which are tabulated and discussed] showed that the efficacy of all the preparations is more or less dependent on the nature of the soil. Thus, abavit B must be applied at the rate of 75 to 100 gm. per cwt. of seed-grain in garden soil, at over 100 in sandy field soil, and at about 100 in clayey field soil. The concentration of tutan should be similarly regulated, but in the case of clayey field soil it is necessary to use 100 to 150 gm. The corresponding rates for copper carbonate are 75 gm. for garden soil, 100 to 150 for sandy field soil, and 150 for clayey field soil. The most uniform results were given by tillantin, the effective concentration of which is 75 gm. in garden and sandy field soil and 75 to 100 in clayey field soil.

Schwaebel (F. X.). **Kupferhaltige Trockenbeizen.** [Copper-containing dusts.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 3, pp. 113–117, 2 figs., 1930.

The results of experiments [which are briefly described and tabulated] in the control of wheat bunt (*Tilletia*) [*tritici* and *T. foetens*] on a Bavarian farm with the copper salt 'W' (a basic copper chloride prepared by Dr. A. Wacker, Gesellschaft für elektrochemische Industrie G.m.b.H., Munich, and applied at the rate of 0·4 gm. per 100 gm. of seed-grain), were eminently satisfactory. The incidence of infection was reduced from 34 per cent. to nil by 'W2' (copper oxychloride + 20 per cent. filler), to 0·44 per cent. by 'W1' (pure undiluted copper oxychloride), and to 0·28 per cent. by 'W3' (copper oxychloride + 5 per cent. filler); the corresponding figure for the plot treated with basic copper carbonate was 7·5 per cent. The germinability of the seed-grain was not impaired and its vigour was enhanced by the treatment.

Noeldechen. **Beizversuche. Welches Beizverfahren soll angewandt werden?** [Disinfection experiments. Which disinfection process shall be adopted?]—*Pflanzenbau*, vi, 9, pp. 267–271, 1930.

Continuing his experiments during 1928–9 in the control of wheat bunt (*Tilletia tritici*) [*T. caries*] by various dry and liquid preparations [*R.A.M.*, vii, p. 435], the writer found that the only ones giving practically complete control were germisan and uspulun-universal (30 minutes' immersion in a 0·25 per cent. solution for the former and 0·5 per cent. for the latter). Germisan was

also effective at 2 to 3 per cent. in the short disinfection process [ibid., ix, p. 100]. Abavit B dust, which proved highly efficacious in the first series of tests, gave disappointing results in the present experiments. Tillantin dust, on the other hand, maintained its comparatively high standard throughout both series of tests, the heaviest infection (1·68 per cent.) occurring in 1928–9.

Discussing the results [which are tabulated] of the tests as a whole, the writer concludes that immersion is the best and most economical form of seed-grain disinfection for large-scale operations. Dusting and the short disinfection process may both be recommended for smaller lots, the latter method being a good substitute for sprinkling.

SCHAFFNIT (E.). **Ertragseinbussen im Getreidebau durch Fusskrankheiten.** [Yield reductions in cereal cultivation through foot rots.]—Reprinted from *Mitt. Deutsch. Landw. Gesellsch.*, [xlv], 12, 5 pp., 5 figs., 1 diag., 1930.

Some general observations on the foot rots of cereals in Germany are followed by a discussion on the relative importance of the different fungi concerned in their etiology. By far the most virulent parasite is *Ophiobolus graminis* [*R.A.M.*, ix, p. 447], which can attack completely healthy plants at all stages of development. The damage caused by the various secondary fungi following *O. graminis*, viz., *Fusarium culmorum*, *F. nivale* [*Calonectria graminicola*], *Leptosphaeria herpotrichoides*, *F. avenaceum*, *O. herpotrichus*, and *Wojnowicia graminis* [ibid., ix, p. 237], is relatively slight.

O. graminis attacks principally the roots and the basal node, occasionally the next, but apparently never extending beyond 15 cm. up the haulm. The young plants may be attacked at the mesocotyl and destroyed before the shoot can be formed, or a short haulm may be produced with an ear which remains empty. Ordinarily, however, the plants are attacked at a somewhat later stage, in which case the shoot flowers but ripens prematurely and forms poor seed. The most suitable designation, in the writer's opinion, for the disease caused by *O. graminis* is 'blackleg'.

The symptoms caused by *F. culmorum* and *C. graminicola* are more like those of a wilt than a foot rot. Spores are frequently produced on the lowest internode or node and on reaching the ear they form a resting mycelium between the glumes and thence infect the seed. *O. graminis*, on the other hand, does not form spores before the harvest, so that the transmission of this fungus by the seed is impossible.

O. graminis is most prevalent on wheat, rye being somewhat less susceptible and barley comparatively resistant, while oats are practically immune. *F. culmorum* causes heavy damage to oat seedlings.

O. graminis grows best at P_H 7·49 and scarcely occurs in acid soils; the same applies to *C. graminicola*.

O. graminis is much more dependent than *Fusarium* spp. on a plentiful water supply in the soil, and during the dry summer of 1929 the latter were much more prominent in Germany, whereas in 1927 and 1928 the situation was reversed.

The writer states that foot rot is favoured by a preceding crop of wheat, rye, and barley, and to some extent by clover, while it is checked by oats and still more by rape [*Brassica napus*] and root crops. Early-sown autumn crops generally suffer more from *O. graminis* than those sown late; the fungus makes little growth at low temperatures, ceasing to develop at 3° C.

Liberal fertilization with phosphorus and nitrogen is recommended, and the paper concludes with some brief observations on the disposal of the stubble, which forms the chief source of infection.

Teterevnikova-Babayan (Mme D. N.). Наблюдения над грибами из рода **Fusarium,** поражающими озимые. [Observations on species of *Fusarium* attacking autumn-sown cereals.]—*Plant Protection* (formerly *La Défense des Plantes*), Leningrad, vi, 5–6, pp. 669–694, 1 fig., 4 graphs, 1930.

This is a full account of the author's investigation in 1926–7 of the species of *Fusarium* causing the so-called winter injury of autumn-sown cereals in the neighbourhood of Leningrad, the results of which were briefly reported by Dobrozrakova [*R.A.M.*, viii, p. 771]. Besides the information already noticed, this paper includes a detailed description of the methods employed in the work, of the morphological and cultural characters of the species of *Fusarium* recorded, and of the agricultural and environmental conditions favouring the development and parasitic activity of the fungi. Stable manure on summer clean fallow was found to encourage the early autumn growth of the cereals and to render them more liable to attack.

A useful bibliography of 46 titles is appended.

Nicolas (G.). **Un parasite dangereux pour certains Escourgeons.** [A dangerous parasite of certain winter Barleys.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 3, pp. 94–96, 1930.

The author states that new observations tend to show that the failure of the north African winter barley in the vicinity of Toulouse attributed in a previous paper [*R.A.M.*, ix, p. 448] to a species of *Helminthosporium*, may have been primarily caused by *Fusarium hordearum* [ibid., ii, p. 54] which was found developing on volunteer barley plants during winter and early spring, much earlier than the *Helminthosporium* appears. In his opinion *F. hordearum* is a much more dangerous parasite of winter barley than *Helminthosporium*, and resistance to it should take a prominent place in the selection of barley varieties for cultivation in the region of Toulouse.

Lobik (V. I.). Испытание действия формалина и углекислой меди на головню Овса (**Ustilago avenae** (**Pers.**) **Jens.**). [Investigation of the effect of formalin and copper carbonate on Oat smut (*Ustilago avenae* (Pers.) Jens.).]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, v, pp. 149–154, 1930. [German summary.]

After a brief reference to the increasing economic importance of loose smut (*Ustilago avenae*) of oats in the Terek Province of North

Caucasus (where *U. levis* [*U. kolleri*] was found on only one plant), the author gives a few details of experiments in 1928 at the Terek Plant Protection Station, which resulted in complete elimination of the smut by seed disinfection with a 1 in 300 solution of formalin. The tests were made on dehulled seed grain of the very susceptible Pobieda [Victory] variety, which was heavily dusted with spores of the smut, preliminary experiments showing that by this method the infection of the resulting crop was raised to 29·4 per cent., as against 9·3 per cent. in the naturally infected controls. When the artificially infected seed was sown late in the season, however, no infection resulted.

Parallel experiments in the control of the smut by dusting artificially infected seed-grain with copper carbonate at the rate of 4 gm. dust to 1,200 gm. seed resulted in a reduction of the field infection from 29·4 to 7·7 per cent., thus showing that copper carbonate is considerably less efficient than formalin [cf. *R.A.M.*, ix, p. 299]. No significant differences were noted in the effect of formalin and of copper carbonate either on the germinability of the seed or on the field stands.

Ayoutantis (A.). **La 'maladie de Poros' des Citrus en Grèce.** [The 'Poros' disease of Citrus in Greece.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 3, pp. 78–81, 1930.

In citing instances of the financial losses caused in lemon groves of Greece by a disease locally known under the names of 'Poros' disease, 'phylloxera', or 'coryphoxera', which was first reported in 1902 from the Agricultural Experiment Station at Poros, and has been variously attributed to *Bacterium gummi* or *Colletotrichum gloeosporioides*, the author states that his observations lead him to consider that it is caused by lignivorous species of fungi [not specified] which cause hadromycosis and the development of which is favoured by unsatisfactory cultural methods and the use of raw stable manure in the groves, as well as by overproduction of the trees. The control measures recommended are based on these assumptions. Sour oranges are attacked to some extent at Galata near Poros, as are to a lesser degree citrons, but Mandarin oranges appear to be quite immune.

Takeuchi (H.). **Penicillium rots of Citrus fruits.**—*Bul. Sci. Fakultato Terkultura, Kjusu Imperia Univ.*, iii, 4, pp. 333–349, 3 figs., 1 graph, 1929. [Japanese, with English summary. Received July 1930.]

Rotting of Satsuma oranges (*Citrus unshiu*) in storage or transit in Fukuoka, Japan, was found to be caused by *Penicillium italicum*, *P. digitatum* [*R.A.M.*, ix, pp. 303, 304], *P. expansum* [ibid., viii, p. 804], and *P. fructigenum* n. sp., the relative incidence of these four organisms being estimated at 89, 73, 0·9, and 28 per cent., respectively. *P. digitatum* and *P. italicum* are parasitic only on citrus fruits, while the other two fungi mentioned are also capable of infecting apples, pears, persimmons [*Diospyros kaki*], and grapes. Control may be effected by five to seven minutes' immersion of the fruit in 2 to 5 per cent. borax.

P. fructigenum is characterized by hyaline, septate hyphae,

2·5 to 5 μ in width ; erect, branching conidiophores, 230 to 500 by 3 to 4·3 μ, occurring in fascicles; and hyaline to pale greenish conidia, 3·1 to 4·6 μ in diameter, with metulae measuring 11·5 to 13·8 by 2·3 to 3 μ. The colonies of the fungus on Czapek's agar are bluish to grey-green and powdery in appearance; reverse Massicot yellow (Ridgway's Color Standards); abundant growth on media containing sucrose or potato starch as a source of carbon; optimum temperature for growth about 27° C., maximum 33°, and minimum 6°. In addition to the fruits mentioned above, *P. fructigenum* produces circular blue lesions on stored Navel oranges, kinkoji (*C. medio-globosa*), and kumquats [*Fortunella* spp.].

CASTAGNOL (E. M.). **Notes sur les essais entrepris pour combattre la maladie des Aréquiers du Huong-Khê (Hà-Tinh).** [Notes on the experiments undertaken to combat the disease of Areca Palms of Huong-Khê (Hà-Tinh).]—*Bull. Écon. de l'Indo-Chine*, N.S., xxxiii, *1930* (*B*), pp. 40–53, 1 col. map, 4 graphs, 1930.

Since 1924 a disease of areca palms [*Areca catechu*], first observed in 1920, has caused much concern in the Hà-Tinh district of Annam (Indo-China), where the value of the yield in 1922 was estimated at $300,000.

The symptoms of the disease are as follows. The leaves show a yellow discoloration, beginning at the edges, and the surface becomes almost entirely covered with small rusty spots. Flowering continues but the production of nuts declines continuously during the first three years, after which the few formed fall before maturity. After the sixth year from the beginning of the attack, the production of nuts ceases altogether, the terminal bud becomes stunted, and the tree dies a few years later. An examination of the root system of affected trees shows extensive rotting, the extremities of the roots being soft and the central cylinder dried out owing to the cortical tissue having rotted away. Bathellier's microscopic examination of affected material revealed the presence of a *Micrococcus*, which is believed to be the causal organism of the disease [*R.A.M.*, vi, p. 160]. Infection appears to occur through the roots and to pass upwards along the wood vessels and the adjacent cells. At first the invaded tissues form fresh layers of defensive cells, which resist penetration for a short time but are soon infected and destroyed in their turn. Several observers have noticed, however, that healthy trees in a good state of cultivation are sufficiently resistant to the parasite to form new secondary roots and finally to overcome the disease.

Very encouraging results in the control of this disease were obtained by cultural measures, including the application to the soil early in the year of a fertilizer composed of 2 loads of farm manure, 3 kg. of phosphate, and 1 kg. of wood ash per tree, followed by hoeing and green manuring (*Vigna*), together with a repetition of the phosphate and potassium, during the first half of September. The yield of 15-year-old palms was augmented by 50 per cent. as a result of this treatment, and that of 20-year-old trees by 40 per cent. It is concluded that the disease is primarily due to poverty of the soil, and that the amelioration of this condition on the lines

indicated above is well within the means of the native cultivators. A detailed discussion of the economic aspects of areca nut production is given.

Reports received from Experiment Stations, 1928–1929.—268 pp., 1 pl., 3 figs., 41 graphs, London, Empire Cotton Growing Corporation, 1930.

In this series of reports for the season 1928–9 sent in by various cotton-growing experiment stations of the British Empire [compiled on the same lines as in previous years: *R.A.M.*, viii, p. 306], the following references are of interest.

At the Shambat Experimental Farm, Sudan, there was a serious outbreak of leaf curl, apparently similar to or identical with the disease described under the same name from Nigeria [ibid., vi, p. 162; viii, p. 307]. The disease appeared to be particularly severe in all pure Sea Island types and most of their crosses with the Sakel and Upper Egyptian cottons, in which it occasionally caused a necrosis of the upper half of the main stem, and is believed to have probably increased their tendency to defective boll opening. Local wild or semi-cultivated cottons showed clear indications of high resistance, and a similar resistance was also noted in the Indian types. Among the American Upland types, some were badly attacked and others only slightly. The most susceptible was Durango, while a family of Cambodia cotton growing alongside was doubtfully, if at all, affected. Four of Parnell's jassid-resistant cottons (U. 4, A. 12, Z. 1, and B. 179) also showed resistance.

In Uganda the black arm disease [*Bacterium malvacearum*: ibid., ix, p. 377] was widespread throughout Northern Teso, with a tendency to increase in virulence northwards, where it caused a total loss of the crop in some areas. The disease broke out in Amuria County in September and spread gradually south, until Serere County was reached in November, as the cool, moist weather during the rains gave ideal conditions for the development and spread of the organism. The only control deemed possible in Uganda under present conditions is the selection of resistant varieties. At the Serere Station, leaf mildew (*Ramularia*) [*areola*: ibid., viii, p. 566] appeared on the progeny rows early in the season, but the plants recovered after a certain amount of defoliation.

Kirkpatrick (T. W.). **Leaf-curl in Cotton.**—*Nature*, cxxv, 3157, p. 672, 1930.

Referring to a statement in an article entitled 'Cotton in Africa' (*Nature*, p. 291, 22nd February 1930) to the effect that leaf curl [see preceding abstract] has been observed on cotton in the Sudan, and that a jassid is implicated in the spread of infection, the writer states that in the Gezira (the chief long-staple cotton-producing area of the Sudan), this disease (which should preferably be termed 'leaf crinkle') is transmitted mainly, if not exclusively, by an undetermined species of whitefly (Aleurodidae).

Golding (F. D.). **Further surveys of insect and fungoid incidence on improved Ishan and other Cottons in Nigeria.**—*Eighth Ann. Bull. Agric. Dept. Nigeria*, pp. 110–129, 1929. [Received June 1930.]

Further investigations were made during 1928–9 on the comparative susceptibility to disease and productivity of Ishan A and local cottons in several localities of Nigeria [*R.A.M.*, viii, p. 307]. At Ilorin bacterial disease [*Bacterium malvacearum*] was found to be a primary cause of shedding, abscission usually occurring in the flower stage; up to 15th December 1928 72 per cent. of the Ishan boll and flower sheds and 59 per cent. of the Ilorin bore bacterial lesions. Heavy damage was also caused by the black arm form of the disease [ibid., ix, pp. 376, 377] in this locality.

At Badeggi *Bact. malvacearum* was prevalent in early November in the angular leaf spot form, while in mid-December it produced severe black arm. Bacterial lesions were the most common form of injury on the boll sheds of both the Ishan and Allen varieties in this locality. At Ibadan, on the other hand, only 2 per cent. of the Ishan boll sheds and 3 per cent. of Meko bore *Bact. malvacearum*.

Burnside (C. E.). **Fungous diseases of the Honeybee.**—*U.S. Dept. of Agric. Tech. Bull.* 149, 42 pp., 6 pl., 5 graphs, 1930.

A detailed account is given of the author's study of the fungal diseases of the bee in North America, the results of which showed the existence there of a number of species of fungi capable of attacking bees either in nature or under experimental conditions. These included some forms already recorded from Europe [*R.A.M.*, v, p. 300; viii, p. 105; ix, p. 524], and belonging to the genera *Aspergillus*, *Saccharomyces*, *Mycoderma*, *Torula*, and *Mucor*. Of these organisms, members of the *A. flavus* group were found to occur most frequently on the bee in nature, causing a mycosis the symptoms of which are described in detail. *A. fumigatus* was also virulently pathogenic, and *A. nidulans*, *A. niger*, *A. glaucus*, and *A. ochraceus* were other bee parasites found in nature. In artificial infection, adult bees developed the disease when the spores of these species were ingested, and also when they were directly inoculated through punctures; the external type of infection is believed, however, to occur very rarely in nature. In the alimentary canal the spores germinate in the food contents; the hyphae penetrate the wall of the canal and under favourable conditions invade all the softer tissues of the body, which becomes mummified. The germ-tubes were able to penetrate the uninjured skin of larvae but not of adult bees in the laboratory. There was evidence of the production of enzymes capable of digesting the tissues of the insect; a toxic substance, of an apparently transient nature, capable of causing fatal poisoning in bees, was also extracted from the mycelium of a strain of *A. flavus*.

Mucor hiemalis was shown to be capable of infecting bees in nature under certain conditions but none of the species of *Penicillium* or other Hyphomycetes found on them is capable of attacking healthy insects. Yeasts are more or less always present in the

alimentary canal without any apparent injury to the bee, though several species are pathogenic when introduced into the blood.

A measure of control may be obtained by dipping or washing all the parts of infected hives with a 20 per cent. solution of formalin or exposing them for 2 or 3 days to formaldehyde gas.

Sartory (A.), Meyer (M.), & Meyer (J.). **Contribution à l'étude des mycoses osseuses; trois cas d'ostéites dues d'une part à l'Actinomyces asteroides (Eppinger) et d'autre part à l'Hemispora stellata.** [Contribution to the study of the osseous mycoses: three cases of osteitis due on the one hand to *Actinomyces asteroides* (Eppinger) and on the other to *Hemispora stellata*.]—*Ann. Inst. Pasteur*, xliv, 3, pp. 298–329, 8 figs., 1930.

Full clinical details are given of three cases of osteitis of fungal origin, with observations on the morphological and cultural characters of the causal organisms. *Actinomyces asteroides* var. *serratus* n. var., responsible for inflammation of the tibia in a youth of nineteen, is characterized by slender, branched hyphae, 0·3 to 0·6 μ in width (0·2 μ in *A. asteroides*), and arthrospores up to 1 μ in diameter, and by whitish (later greyish-yellow), mamillated colonies on standard media.

Hemispora stellata [*R.A.M.*, vii, p. 720] was isolated from a swelling, which developed after a fall, in the right external malleolar region of the right foot of a twelve-year-old boy, and also from the calcaneum in the left foot of a nineteen-year-old girl. All the cases were cured by appropriate treatment.

Weiss (P.). **Sur un Sterigmatocystis agent d'une dermatose semblable au Pityriasis versicolor flava: S. cinnamominus n. sp.** [A species of *Sterigmatocystis* causing a dermatosis resembling pityriasis versicolor flava: *S. cinnamominus* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, viii, 2, pp. 189–193, 1 pl., 1930.

A brief account is given of a case of slight dermatosis of the chest and neck of a Peruvian adult, accompanied by a sharply defined depigmentation and slight cutaneous eruption. Isolations from the squamae yielded a fungus which the author refers to the genus *Sterigmatocystis* [*Aspergillus*] which formed conidiophores with a double row of phialids and brown conidia, 1 to 2 μ in diameter. Secondary spores were borne laterally on the hyphae and were sessile or pedicellate, round, thick-walled, and 3 to 4 μ in diameter. The author considers the fungus to be a new species and names it *S.* [*A.*] *cinnamominus* because of the cinnamon colour of its colonies on certain media. Its pathogenicity to man was proved by one inoculation which reproduced the symptoms originally observed.

Coccheri (P.). **Micosi polmonare da Sterigmatocystis nigra Van Tieghem.** [Pulmonary mycosis caused by *Sterigmatocystis nigra* Van Tieghem.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. iv, 1, pp. 161–181, 8 figs., 1929. [Latin summary.]

The author gives full clinical details of a case of chronic

bronchitis and fibrinous pleurisy in a six-year-old child, from whose expectorations *Sterigmatocystis nigra* (*Aspergillus niger*) was constantly isolated until adequate treatment led to the suppression of pathological symptoms. This well established case of pulmonary affection caused by the fungus, together with the fact that it was shown to be pathogenic to white mice, is a further proof that *A. niger* can cause disease in man and animals under certain conditions.

Carrion (A. L.). **Observations on dermatomycosis in Porto Rico.**—*Porto Rico Journ. Public Health & Med.*, March, 1930. [Abs. in *Journ. Trop. Med. & Hygiene*, xxxiii, 12, pp. 183–184, 1930.]

Cultures on Sabouraud's medium of material from active lesions of foot dysidrosis in Porto Rico yielded a fungus characterized by a thin, diffuse, snow-white, pleomorphic growth, with marked, irregular, radial folding in the centre of the colonies, while the periphery shows a mauve discoloration, turning dull green farther in. The septate, branching hyphae, 3 to 6 μ in width, have characteristic arthrospores (in three-day-old cultures); piriform, ovoid, or nearly round conidia, 2 to 4 by 3 to 6 μ, borne laterally and terminally on 'thyrses'; and septate 'fuseaux' with rounded ends and festooned sides, measuring 12 to 60 μ.

This organism differs in various respects [which are indicated] from the closely allied *Trichophyton granulosum, T. lacticolor, T. gypseum* [*R.A.M.*, ix, pp. 313, 314], and *Epidermophyton gypseum*, but could not be determined pending further information regarding this group of fungi.

Hashimoto (T.), Irizawa (T.), & Ota (M.). **Une variété blanche du Sabouraudites ruber (Epidermophyton rubrum ou purpureum).** [A white variety of *Sabouraudites ruber* (*Epidermophyton rubrum* or *purpureum*.]—*Japanese Journ. of Dermatology*, xxx, 3, pp. 243–251, 9 figs., 1930. [French summary on pp. 31–32.]

A white variety of *Trichophyton purpureum* [*R.A.M.*, viii, p. 575], a frequent source of marginate eczema, circinate herpes, trichophytotic dysidrosis, and onychomycosis in Japan, was first obtained in pure culture by Y. Kato in 1925, and inoculated on guinea-pigs with positive results in the following year. Cultures of the fungus on Sabouraud's medium are chalk-white, sometimes faintly tinged with pink or mauve, finely furrowed, and slightly protuberant at the centre. Red cultures may be obtained by sowing the reverse coloured (reddish-brown or yellowish) portion of a white culture mixed with some red fragments, whence it would appear that *T. purpureum* produces two types of hyphae, one capable of producing pigment while the other is devoid of this property.

Maffei (L.). **Nuova specie di Cephalosporium causa di una cheratomicosi dell' uomo.** [A new species of *Cephalosporium* causing keratomycosis in man.]—*Att. Ist. Bot. R. Univ. di Pavia*, Ser. iv, 1, pp. 183–198, 9 figs., 1929. [Latin summary.]

This is a detailed account of a fungus which was isolated from

a lesion of the cornea of an adult in Parma, probably caused by the introduction of hay dust into the eye. The morphological and cultural characters of the organism [which are fully described] lead the author to refer it to the genus *Cephalosporium*: it differs from other congeneric species pathogenic to man [the measurements of which are given in a table] by its much larger and septate hyphae, 2·5 to 5 μ in diameter, by its thick, branched, unseptate conidiophores, 27 to 47 μ long by 2·3 to 4·6 μ broad at the base, by the size and shape of its conidia, which measure 2 to 10 by 2 to 5 μ and are roundish to oblong-ovoid or pyriform, and by the presence in cultures of brownish chlamydospores borne singly or in series. It is considered to be new to science and is named *C. serrae*, with a Latin diagnosis. When inoculated into the eye of certain laboratory animals it produced a lesion very similar to the original one in the human patient.

Foister (C. E.). **Blossom blight and shanking of Tulips.**—*Gard. Chron.*, lxxxvii, 2253, pp. 171–172, 2 figs., 1930.

In addition to the blossom blight of tulips [the symptoms of which are briefly described] occurring in the United States as a result of infection by *Phytophthora cactorum* [*R.A.M.*, iv, p. 740], a second type of *Phytophthora* disease has recently been observed on this host in England and Scotland. The latter disease, known to growers as 'shanking', was first recorded in 1928, when a fungus identified as *P. cryptogea* was isolated at Harpenden from infected plants. Subsequently the writer found what is believed to be the same fungus causing shanking in Scotland. In culture the oospores are 23·55 μ in diameter, the oogonia 30 μ, and the antheridia entirely amphigynous. Sporangia were eventually formed on pieces of decayed tissue in sterilized bog-water; they have no papillae and measure 25 by 20 μ.

Infection takes place from the soil, probably from the oospores. It appears to begin on the roots, advancing upwards into the base of the bulbs and thence to the flowering stem. The scale leaves are attacked at an advanced stage of the disease. There are no striking symptoms in the early stages, but at the time of floral development the petiole either fails to elongate properly and the bud remains closed, or, if the flower has partially opened, it soon withers and the petiole droops and dies.

The writer recommends that all diseased plants be removed immediately, and the surrounding soil treated with 2 per cent. formalin or copper sulphate. The growing plants should be watered with a solution of Cheshunt compound [ibid., i, p. 373]. The temperature of the houses should be kept as low as possible without injuring the plants (*P. cryptogea* grows well at 77° F.), and excessive humidity should be avoided. The variety most commonly attacked in England is said to be William Copland, Vermilion Brilliant and Tea Rose being also susceptible.

Nicolas (G.) & Aggéry (Mlle). **Observations sur Stagonospora crini Bubak et Kabat.** [Observations on *Stagonospora crini* Bubák et Kabát.]—*Bull. Soc. Myc. de France*, xlv, 4, pp. 297–299, 2 figs., 1930.

A very brief description is given of a spot disease which de-

veloped on living leaves of *Crinum longifolium* and *C. asiaticum* (but not on *C. moorei* growing alongside) in the Botanic Garden of Toulouse. The spots at first appear on the upper surface and gradually penetrate to the under side of the leaf; they are of varying sizes, blood-red in colour, and finally become perforated in the centre. The affected tissues contain fairly broad, hyaline, septate hyphae, which give rise to pycnidia measuring 110 to 120 μ on *C. longifolium* and 170 to 200 μ on *C. asiaticum*; the pycnospores are white, cylindrical, occasionally slightly bent, 2- to 5-celled, and measure 8·5 to 21·1 by 4·7 to 5·5 μ in diameter. Morphologically the organism closely resembles *Stagonospora crini* described in 1908 by Bubák as a saprophyte on dead leaves of *C. powellii* in Bohemia, and the authors refer it to this species.

Troitzsch (O.). **Mittel gegen Cinerarien-Mehltau.** [Remedies for Cineraria mildew.]—*Gartenwelt*, xxxiv, 17, pp. 231, 1 fig., 1930.

Popular notes are given on the prevention and control of cineraria mildew [? *Erysiphe cichoracearum*: *R.A.M.*, ix, p. 386] by the use of a good potting soil to which nitrophoska J. G. I. should be added at the rate of 1·5 to 2 kg. per cu. m. The temperature of the greenhouse should be kept fairly low and adequate ventilation ensured. Diseased material should be burnt in order to avoid the dissemination of infection by the highly resistant winter spores. Spraying the plants with 1 per cent. solbar is also recommended.

Nicolas (G.) & Aggéry (Mlle). **Remarques sur Cycloconium phillyreae Nicol. et Agg.** [Notes on *Cycloconium phillyreae* Nicol. et Agg.]—*Bull. Soc. Myc. de France*, xlv, 4, pp. 294–296, 1930.

The fact that the visible symptoms of the leaf disease of *Phillyrea angustifolia* caused by *Cycloconium phillyreae* [*R.A.M.*, viii, p. 447] entirely disappeared towards the end of June 1928, while the disease again broke out with enhanced severity in the spring of 1929 in the absence of any apparent source of infection, leads the authors to believe that the fungus may live as a slowly growing subcuticular mycelium on the leaves remaining attached on the bush from one season to the next. Plants of *P. media* and *P. latifolia* growing at a distance of a few hundred metres from the infected *P. angustifolia* have so far remained free from infection.

Hino (I.). **Notes on sclerotia of the causal organism of Milk Vetch rot.**—*Bull. Miyazaki Coll. of Agric. and Forestry, 1930*, 2, pp. 93–112, 1930.

The sclerotia of *Sclerotinia trifoliorum* [*R.A.M.*, viii, p. 793], the causal organism of milk vetch (*Astragalus sinicus*) rot in Japan, are stated to be generally formed on the stems or roots, though sometimes appearing on the stem or in the soil. These bodies are produced twice annually, in the spring and autumn; when dried they weigh 0·95 mg. to 0·1 gm. and their specific gravity is about 0·87. The black outer coat, composed of brown round cells measuring 4 to 9 or rarely 13 μ (average 6·5 μ), with walls of 1·2 μ

in width, is highly resistant to low temperatures and also to fungicidal action in general; the sclerotia may, however, be destroyed by ten minutes' immersion in corrosive sublimate. The inner part or medulla of the sclerotium is composed of hyaline, rounded cells measuring 6·5 to 10 μ in diameter (average 8 μ), with walls 2 μ thick. Apothecia usually develop from the sclerotia about 20 days after sowing in soil. The sclerotia do not pass through a resting period. During the growing season the stem bases of the plants may be infected by mycelium arising from discharged ascospores which have germinated in the soil. The primary source of infection, however, may be the mycelium arising directly from the sclerotia in the soil or mixed with the seeds.

Drechsler (C.). **Leaf spot and foot rot of Kentucky Bluegrass caused by Helminthosporium vagans.**—*Journ. Agric. Res.*, xl, 5, pp. 447–456, 5 figs., 1930.

A full account is given of a disease of Kentucky bluegrass (*Poa pratensis*) which was first recorded in 1922 and briefly described by the author in a previous paper [*R.A.M.*, iii, p. 65], and the causal organism of which was named *Helminthosporium vagans*. Although in the first report the fungus was stated to be a relatively innocuous parasite, in subsequent seasons it caused considerable damage, especially in fairways of golf courses subjected to close cutting, a practice which encourages a delicate habit of growth of the host. In plants left to grow to full size, the lesions on the leaves are of the eye spot character typical of *Helminthosporium* diseases of Graminaceous plants, and do not usually kill the leaves. On close-mown lawns, however, all the foliar organs and the parts enclosed by them are invaded and the whole plant eventually dies.

The cultural characters of *H. vagans* are not described in detail, since they are stated to be very similar to those of other species of the genus. In pure culture the fungus usually produces smaller conidia than on the host. The dimensions of the latter, in 200 living conidia selected at random, varied from 31 to 140 by 11 to 25 μ. The germination of the conidia of *H. vagans* by germ-tubes indiscriminately from the intermediate as well as from the terminal cells strongly suggests its close affinity with the series of species of *Helminthosporium* with a *Pyrenophora* ascigerous stage.

Muncie (J. H.) & Suit (R. F.). **Studies of crowngall, overgrowths and hairyroot on Apple nursery stock.**—*Iowa State Coll. Journ. of Sci.*, iv, 2, pp. 263–313, 7 pl., 1930.

This is a detailed report of the investigation in 1925 to 1927 of representative apple nurseries in 13 of the eastern and southern United States (in which 55,668 piece-root grafted and 30,632 budded two-year-old trees were examined) for the purpose of determining the occurrence and prevalence of crown gall, overgrowths, and various types of hairy root, and also the relationship of these malformations to *Pseudomonas* [*Bacterium*] *tumefaciens*. The observations showed that from 16·8 to 45·4 per cent. of the grafted and from 6·5 to 7·6 of the budded trees exhibited over-

growths, while true crown gall occurred on an average in less than one per cent. of either the grafted or budded trees, and the percentage of trees showing hairy root in the absence of overgrowths ranged from 3·4 to 0·69 in the budded and from 2·7 to 0·65 in the grafted trees.

Considerable details are given of isolation experiments from all the above types of malformations, which yielded *Bact. tumefaciens*, capable of producing galls on young tomato plants, from a very small percentage of trees showing the various forms of hairy root; a number of isolations, however, yielded organisms which, although non-pathogenic on tomato, induced the development of hairy root on the sugar beet and on healthy apple shoots. In infection experiments with *Bact. tumefaciens*, using non-disinfected apple seed in unsteamed soil, outgrowths were produced only on the seedlings that were inoculated with the organism, while hairy root without outgrowths occurred independently of inoculation, wounding, or soil infestation with *Bact. tumefaciens*.

A very full account is also given of the biological study on a number of media of five culture strains of organisms isolated from apple seedlings and trees affected with different forms of hairy root, as compared with strains of *Bact. tumefaciens* and *Bacillus radiobacter* [*R.A.M.*, ix, p. 232]. All were motile: *Bact. tumefaciens* by means of polar and *B. radiobacter* by means of peritrichous flagella, while of the hairy root organisms, three cultures (1207, 1289, and 1294) showed peritrichous and two (1544 and 1555) polar flagella. Morphologically the strains of *B. radiobacter* were easily distinguishable from *Bact. tumefaciens* and the hairy root organisms by the formation of capsules, the radiate arrangement in broth cultures, and the distribution of the flagella. In media containing arabinose the growth reaction of *B. radiobacter* was typically acid, while that of *Bact. tumefaciens* and the hairy root organisms was alkaline. In broth cultures containing various carbon compounds, one group of the hairy root organisms produces an acid reaction (cultures 1207 and 1294), and another, an alkaline reaction (cultures 1544 and 1555); culture 1289 produced an alkaline reaction with all the carbon compounds tested except raffinose and glycerol.

All the strains of *Bact. tumefaciens* produced typical gall formation in young tomato plants, which were immune from *B. radiobacter* and the hairy root organisms. On sugar beet, inoculation with six strains of *Bact. tumefaciens* gave rise to typical galls, and four of the hairy root organism caused a slight swelling with an abundance of roots; one strain of *Bact. tumefaciens* from peach, and the fifth strain (1289) of the hairy root organisms, however, produced galls bearing only a few hairy roots on the sugar beet. All the hairy root organisms induced small, hard swellings with hairy roots and root primordia on stems of the Paris daisy (*Chrysanthemum frutescens*), while *Bact. tumefaciens* only induced large, soft galls without roots. Similar differences were also noticed in the results of inoculations with *Bact. tumefaciens* and the hairy root organisms on scions of young apple trees.

The results of this investigation suggest that crown gall and hairy root may be caused by distinct organisms [but cf. ibid., ix,

p. 292], and that two types of organisms, one closely related to *Bact. tumefaciens* (cultures 1544 and 1555), and the other differing from it in morphological and cultural characters (cultures 1207 and 1294) may be involved in the causation of infectious hairy root.

GOLDSWORTHY (M. C.) & SMITH (R. E.). **'Sour sap' in trees of the genus Prunus.**—*Science*, N.S., lxxi, 1846, p. 506, 1930.

Considerable losses are stated to occur annually in California as a result of the 'sour sap' disease of stone fruit trees [*R.A.M.*, viii, p. 550], thousands of which (usually between the ages of three and twelve years) die suddenly in certain seasons, generally in the winter or early spring. Two distinct forms of the disease have been observed, one caused by bacteria and the other due to the presence of stagnant soil water affecting the roots during the early growing period of the trees.

The bacterial form of sour sap is the more common. The organisms usually enter through wounds, e. g., pruning or grafting cuts, during the winter months and cause a progressive disease of the cortical region, generally in the trunk above the bud union or in the main crotches, but sometimes killing only certain limbs or one side of the tree. The roots are rarely affected, the trunk infections usually ceasing abruptly at soil level and a mass of suckers being sent up from the root. The parenchymatous tissues, including the cambium, are invaded, the cells and intercellular spaces containing bacteria, usually in zoogloeal masses but sometimes free and motile. This disease occurs in epidemic form only occasionally, indicating a correlation with certain seasonal climatic or soil moisture conditions.

The writers' investigations cover peaches, cherries, wild and cultivated plums, apricots, and almonds, in all of which the typical symptoms of sour sap have been reproduced by inoculation. Up to the present six types of bacteria have been isolated, each of which has caused extensive lesions when inoculated into susceptible hosts during the period from December to February.

The form of souring induced by stagnant soil water is occasionally prominent in the spring when the trees are starting into leaf. The leaves turn yellow and wilt, become brown at the edges, and finally die. The diseased roots become very discoloured and sour and also die. Recovery may take place if the water is drained off. The subsequent development of bacterial gummosis in trees affected by either type of sour sap may further complicate the question of primary etiology.

Inspection and certification of Strawberry plants and Black Currant bushes.—*Journ. Min. Agric.*, xxxvi, 11, pp. 1073–1078, 1930.

Details are given of a system initiated by the English Ministry of Agriculture in 1928 for the inspection and certification of strawberry runners and black currant cuttings destined for propagation, in extension of the Ministry's 'clean seed' policy. The certificates ensure that at the time of inspection the stocks were true to type,

vigorous, and, so far as could be seen, free from diseases. Out of over one million black currant bushes examined in 1928 and 1929, 12,100 were rejected owing to the presence of reversion [*R.A.M.*, ix, p. 394], 18,000 owing to the presence both of rogues and reverted bushes, and 7,000 owing to weakness and reversion.

Eriksson (J.). **Sur l'hibernation du Puccinia ribis DC à l'état végétatif dans les bourgeons d'hiver de la plante hospitalière.** [On the overwintering of *Puccinia ribis* DC in a vegetative condition within the winter buds of the host plant.]—*Comptes rendus Acad. des Sciences*, cxc, 13, pp. 815–817, 1930.

The author states that on re-examining in 1929 slide material prepared in 1903 from sections of dormant buds and petioles of rusted (*Puccinia ribis*) and healthy bushes of *Ribes rubrum*, he observed in the meristematic tissues of the diseased plants structures and cell inclusions which were absent from the corresponding tissues of the healthy bushes. In the buds some of the structures were thick-walled, disposed in chains, and strongly reminiscent of chlamydospores, while certain cells of the cortical tissue of the petioles contained a colloidal, granular substance which the author interprets as a mycoplasmic state of the parasitic fungus.

MacDaniels (L. H.) & Furr (J. R.). **The effect of dusting-sulfur upon the germination of the pollen and the set of fruit of the Apple.**—*Cornell Agric. Exper. Stat. Bull.* 499, 13 pp., 1 pl., 1 fig. [on title page], 1930.

Laboratory and orchard experiments [the results of which are presented in tabular form] in 1929 indicated that, under certain conditions, sulphur dust deposited on the stigmas of apple blossoms prevents the germination of the pollen and reduces, occasionally to a very considerable extent, the setting of the fruit. It was shown, however, that the sulphur exerted its inhibiting action on the pollen grains only when in actual contact with, or in very close proximity to them, and that if the sulphur was dusted on the flowers after fertilization had taken place or when the pollen tube had entered the style, no injurious effect ensued. The inhibiting action of the sulphur on the germination of apple pollen is in line with its fungicidal action on the hop powdery mildew [*Sphaerotheca humuli*: *R.A.M.*, ix, p. 468].

Iversen (K.). **Oversigt over de for Landbruget vigtigste Resultater af Statens Forsøg i Plantekultur.** [Survey of the outstanding agricultural results of the State experiments in plant cultivation.]—*Tidsskr. for Planteavl*, xxxvi, 1, pp. 1–148, 4 graphs, 1930.

The section of this report dealing with control of plant diseases (pp. 127–140) contains directions, based on the results of official experiments in Denmark, begun in 1929, for combating a number of well-known fungous, bacterial, and physiological diseases of cereals, root crops, and potatoes.

Bodnár (J.) & Gervay (Wilhelmine). **Einfache und schnelle analytische Methoden zur Bestimmung des Wirkungssubstanzgehalts von Pflanzenschutzmitteln. V. Mitteilung. Die titrimetrische Bestimmung des Formaldehyds in Saatgutbeizmitteln.** [Simple and rapid analytical methods for the determination of the active substance content of plant protectives. Note V. The titrimetric determination of formaldehyde in seed-grain disinfectants.]—*Zeitschr. für Analyt. Chemie*, lxxx, 3–4, pp. 127–134, 1930.

The writers' experiments [the technique of which is fully described and the results discussed and tabulated: cf. *R.A.M.*, vii, p. 796] showed that the other substances contained in the formaldehyde seed-grain disinfectants, kalimat, kalimat B [ibid., viii, pp. 769, 816], chlorol F, resinol [ibid., vii, p. 350], and salan, viz., phenol, hydrochloric acid, glycerine, resin soap, and sodium chloride, do not interfere with the determination of formaldehyde by the hydrogen peroxide and sodium sulphite method. In the formaldehyde disinfectant sublimoform, on the other hand, the formaldehyde cannot be directly titrated on account of the presence of mercuric chloride. The best method for the determination of formaldehyde in sublimoform is to distil it off (after the addition of potassium chloride to prevent over-distillation of the sublimate) and analyse the formaldehyde content of the distillate. Quantitative over-distillation of the formaldehyde takes place when the salt-containing formaldehyde solution is allowed to evaporate to dryness and then moistened with water.

Knudson (L.). **Flower production by Orchid grown non-symbiotically.**—*Bot. Gaz.*, lxxxix, 2, pp. 192–199, 3 figs., 1930.

Continuing his experiments in the asymbiotic growing of orchids [*R.A.M.*, ix, p. 398], the writer sowed seeds of a *Laelia-Cattleya* hybrid in a tube culture containing Pfeffer's solution with monobasic potassium phosphate plus 2 per cent. glucose and 1·5 per cent. agar, the reaction of the sterilized medium being P_H 6. About ten months later a few seedlings were transferred to a 250 c.c. Erlenmeyer flask containing nutrient solution with 1·5 per cent. agar but no sugar, at P_H 5·8. Rather more than 16 months later a single plant with several leaves two inches in height was transferred to a 12 l. flask containing 4 l. of one-half strength of this medium, adjusted by the addition of N/10 hydrochloric acid to a P_H value of 4·9, the agar content remaining at 1·5 per cent. New growth rapidly appeared and the plant flowered about five years later. The root system was extensively developed, only two out of a total of 27 roots having died. No sign of the orchid fungus [*Rhizoctonia repens*: ibid., v, p. 177] was detected in the agar medium. This organism was, however, found in the roots of five plants developing from seedlings transplanted from the above-mentioned solution to osmunda fibre, the usual procedure in practice. The roots of these plants were much less vigorous than those of the specimen described above.

THORNTON (H. G.). **The influence of the host plant in inducing parasitism in Lucerne and Clover nodules.**—*Proc. Roy. Soc. London*, Ser. B, cvi, B. 742, pp. 110–122, 5 pl., 1 fig., 1 graph, 1930.

The results of experiments described in this paper showed that when lucerne seedlings inoculated with the root nodule organism (*Bacillus radicicola*) are placed in the dark, the production of fresh nodules and the growth of those already formed is soon arrested, and the bacteria in the latter become parasitic on the host tissue, destroying the cytoplasm and nuclei of the infected cells, and invading the cell walls and intercellular spaces. It was further shown that this process is very similar to that which occurs in old nodules of lucerne and clover plants growing in the light. It is suggested that in both cases the change from symbiotism to parasitism in the bacteria is caused by lack of carbohydrate, which forces the organism to derive its source of energy from the host tissue, and that in normal tissue some other factor limits the activity of the organism and prevents it from attacking the host. Some evidence suggests that this factor is air, especially as lucerne seedlings growing in agar inadequately supplied with air did not appear to derive any benefit from the presence of their nodules, though the bacteria in the latter did not become parasitic.

MARESQUELLE (H. J.). **Etudes sur le parasitisme des Urédinées.** [Studies on the parasitism of the Uredinaceae.]—*Ann. Sci. Nat., Bot.*, Sér. x, xii, 1, pp. 2–124, 4 pl., 43 figs., 1930.

A detailed account is given of a comprehensive series of investigations undertaken by the author from a physiological and morphological point of view into the part played by the Uredinaceae in the life of their hosts.

Numerous respiratory tests [the results of which are tabulated] made with leaves of *Euphorbia peplus* infected by *Melampsora helioscopiae, Malva silvestris* infected by *Puccinia malvacearum, Adoxa moschatillinia* infested by *P. adoxae*, and *E. silvatica* attacked by *Endophyllum euphorbiae-silvaticae* showed that in all cases the respiratory activity of the diseased leaves was greater than that of healthy ones. Other tests [which are described] demonstrated that this increase in respiration took place before the maturation of the sori and decreased markedly while the spores were being liberated. It was further ascertained from studies of *Gymnosporangium sabinae* on pear and various other cases of infection by the Uredinaceae that the increased metabolism remained strictly confined to the affected tissues, healthy tissue having normal respiration even when adjoining the former. It is concluded that increased metabolism is a local phenomenon associated with the presence of the parasite. Malformations and hypertrophies are not correlated with respiration.

Anatomical studies of tissue changes produced by the Uredinaceae are described, those causing localized hypertrophy being distinguished from those whose effect is more generalized. In the former group the author deals with *Puccinia buxi* on *Buxus sempervirens, P. coronata* [*P. lolii*] (aecidial stage) on *Rhamnus*

frangula, *Roestelia cancellata* on pear, and *Gymnosporangium confusum* on *Juniperus oxycedrus*, others being listed. The second group includes *Uromyces pisi* (aecidial stage) on *Euphorbia cyparissias*, *P. vincae* on *Vinca major*, *Aecidium punctatum* on *Anemone coronaria* and *A. ranunculoides*, and *P. fusca* and *Aecidium leucospermum* on *A. nemorosa*. A list is given of European Uredinaceae which produce generalized infection.

A detailed description is given of the morphology and anatomy of the witches' brooms caused by several species of rusts, including *G. gracile* on *J. oxycedrus*, *Aecidium elatinum* on *Abies pectinata*, and *Pucciniastrum goeppertianum* on *Vaccinium vitis-idaea*, a list being given of other known cases of witches' broom formation by rust fungi. They are divided into two classes—'monostype' brooms in which the young branches show hypertrophy and grow vertically, but only one arises from each node, and 'polystype' brooms, characterized by a tuft of branches coming from one part of the tree, the branches themselves being normal in structure. From the close relationship observed to exist between monostype brooms and localized hypertrophy the author formulates the general law that a stem undergoing generalized, precocious hypertrophy grows vertically. Between any two widely dissimilar parasitic deformations, such as a witches' broom and the swelling of a leaf, there exists no difference other than the site of the hypertrophy; when this is in the region of a growing point, a monostype witches' broom results. The morphological specificity of an abnormal growth is due not to the chemical specificity of the secretion of the causal agent but to the biological specificity of the mode of life of the two associated organisms.

A long bibliography is appended.

Ramsey (G. B.) & Bailey (Alice A.). **Effects of ultra-violet radiation upon sporulation in Macrosporium and Fusarium.** —*Bot. Gaz.*, lxxxix, 2, pp. 113–136, 1 pl., 2 figs., 10 graphs, 1930.

This is an expanded account of the authors' investigations on the effects of ultra-violet radiation on spore production in *Macrosporium tomato* and *Fusarium cepae*, a condensed notice of which has already appeared [*R.A.M.*, ix, p. 400].

Pieper. **Die Ursachen und Wirkungen des Kartoffelabbaues.** [The causes and effects of Potato degeneration.]—*Illus. Landw. Zeit.*, l, 10, pp. 134–135, 1930.

In central and western Germany a reduction of 20 to 30 per cent. from virus diseases is by no means uncommon in the potato crop. The two most important are mosaic and leaf roll, of which the latter is the principal cause of damage in Germany. The rapidity and extent of degeneration is comparatively slight in Allerfrüheste Gelbe, Parnassia, and Rosafolia, and very pronounced in Gratiola, Odenwälder Blaue, and Müller's Frühe. Most loss occurs after dry seasons, such as those of 1921, 1923, 1925, and 1928, and even in districts where degeneration is normally severe healthy seed may be obtained during cool, damp summers. Soil conditions are not thought to have much influence on these

diseases, but the excessive use of stable manure or potash may increase them by inducing metabolic disturbances. Attention is drawn to the desirability of procuring seed potatoes from the healthy eastern districts for planting in the central and western regions of Germany.

SALAMAN (R. N.). **Crinkle 'A', an infectious disease of the Potato.**—*Proc. Roy. Soc. London*, Ser. B, cvi, B741, pp. 50–83, 4 pl., 1 fig., 1930.

A full account is given of a detailed study of Crinkle A, a disease corresponding to Murphy's crinkle [*R.A.M.*, i, p. 250] in the President variety of potato, which was undertaken following the discovery by the author and Le Pelley of another form of the disease which, although similar in appearance, is essentially distinct in its reactions and is termed 'para-crinkle' [see next abstract].

The average incubation period of the disease in graft infections on President is 20 days. The first visible symptoms appear in the apical leaves of the new growth from the node on the stock stem immediately below the scion as pale areas along the veins of the leaflets, accompanied by a puckering or deformity of the blades and a very definite waving of the edges. Stunting of growth and brittleness of the stems are later symptoms, whilst bushy, many-stemmed, dwarfed plants, typical of crinkle in the field, only develop in the second year. In some cases minute necrotic spots form on the leaves, usually at the junction of two finer veins, and fine necrotic streaks sometimes appear on the under side along the veins and later on the stem.

When diseased President scions were grafted on healthy plants of other varieties, the clinical symptoms induced varied from those of a typical crinkle to acute streak, while in Abundance only a mosaic developed, which tended to fade away. The results obtained in these experiments are considered to indicate that the differences observed in the varietal reaction to infection with crinkle 'A' by grafting may be due to a modification of the virus itself by passage from one variety to another, as well as to individual varietal response of the host.

Inoculation of the same potato varieties by means of needle punctures produced a modified form of disease; where grafting gave a crinkle, needling produced mosaic; where grafting caused streak, needling gave mosaic (except in Epicure, which again developed streak); and where mosaic was induced by grafting, a mild mosaic was produced by needling. Similar results were also obtained when healthy plants were grafted with healthy scions of the same variety which had been kept for four days in a dilution of crinkle 'A' juice from President with an equal volume of water, at the end of which time they had imbibed most of the liquid. The modified form of the disease is again reproduced when reinoculated on the same varieties. The differences in the results of infection by grafting and by needle inoculation may be primarily due to the differences in the amount of virus transmitted (massive in the former and minute in the latter).

It is suggested that crinkle 'A' is caused by a mixture of viruses, one element of which is responsible for the crinkle-mosaic

type, and another for the streak type; and this is supported by the results of experiments with healthy *Datura stramonium* plants grafted with crinkle-diseased President scions or inoculated with crinkle 'A' juice by needle punctures. Grafted *D. stramonium* plants never regained the size of the controls; the new leaves remained small and lanceolate; the veins of the young leaves showed a definite clearing, and the leaves became ruffled and mottled, the mottling developing later into yellow, relatively large patches. In needle-inoculated plants, the first and most constant symptom was a clearing of the veins, causing them to stand out boldly against the dark green background of the leaf; this was followed by a mottling usually beginning from the base of the leaf. A characteristic feature was the persistence along the margins of the cleared veins of a fine line of intensely green tissue.

The virulence of the crinkle 'A' virus appeared to be modified by passage through *D. stramonium* since, when transferred to healthy potato plants, it produced mosaic instead of crinkle, except in Epicure and Arran Chief, in which a lethal streak developed. Reinoculation to *D. stramonium*, however, always reproduced the same reaction as the original virus, whether the latter was derived directly or indirectly from President or any other variety tested. A series of 'double grafts' [a description of which is given], in which a piece of *D. stramonium* stem was inserted between a healthy potato stock and a diseased potato scion, indicated that the modification of the virus is dependent on the interaction of the metabolic products of the actively growing *D. stramonium* leaf and the virus, since the passage of the latter through a solid section of *D. stramonium* stem not bearing leaves did not appear to have any effect on it, but when the *Datura* stem had a node with active leaves only the modified virus passed through.

The experiments also provided some evidence that streak is not the clinical expression of a single specific virus, since President can convey to Great Scot a lethal streak, without itself showing any symptoms of the disease, and since in some cases President plants were killed in a few days by streak when grafted with scions of certain relatively healthy looking Up-to-Date or Duke of York plants.

The paper terminates with a description of the symptoms of crinkle 'A' in the potato varieties Arran Banner, Arran Comrade, Champion, and Irish Chieftain, and of the reaction of other varieties, of *D. stramonium*, and of tobacco (which was inoculated with the production of mottling and sometimes irregular rings) to infection with the disease as found in President and other potato varieties.

Salaman (R. N.) & Le Pelley (R. H.). **Para-crinkle: a Potato disease of the virus group.**—*Proc. Roy. Soc. London*, Ser. B, cvi, B742, pp. 140–175, 5 pl., 1930.

This is a full account of the authors' study of the 'para-crinkle' disease of the potato [see preceding abstract], the presence of which in apparently entirely healthy plants of the King Edward variety had been demonstrated in preliminary experiments in 1927 and 1928, and which, when transferred to President, did not produce any visible symptoms, although the inoculated plants were proved

to be carriers of the disease. Both varieties may vary slightly in their apparent health in the field and in glasshouses, and in one case a President plant grafted with an Arran Victory scion infected with the disease during three consecutive years developed a mild but definite mosaic.

Arran Victory plants were readily and severely infected by grafting with scions from a carrier plant. In some cases the clinical symptoms developed very rapidly, every leaf of the younger parts of the plants being involved in the course of 24 to 48 hours; the first symptom then was a very definite blotching with yellow spots, rapidly followed by deformity and waving. When the symptoms develop more slowly, the first sign is a single bright blotchy patch of chlorosis at the junction of the larger veins, accompanied from the earliest stage by local puckering and deformity of the blade and waving of the edge of the leaf. Clearing of the veins is not so prominent nor so constantly an early feature as in the case of crinkle 'A', but it was occasionally very marked. The blotchy spots increase in number and rapidly become thinned and partially necrotic, with consequent severe deformity. Growth of the leaflets is more or less completely arrested. Short, brown streaks appear on the veins of the under side, as well as on the petioles and stems. In plants raised from diseased tubers the stems are numerous, short, and brittle; the foliage is clumped and grossly deformed, and the plants present the typical picture of curly dwarf. Unlike crinkle 'A', the symptoms rather tend to become exacerbated during growth, and it is only when maturation sets in that the blotching fades away and the extreme waving becomes somewhat straightened out.

A description is also given of the reaction of a number of other potato varieties to para-crinkle. These varieties fell into four groups, namely, those that react by a severe crinkle (Arran Chief); those that produce a mosaic instead of crinkle (Arran Comrade, Great Scot, Majestic); those (carriers) that do not react visibly (Abundance, President, and probably Champion), and those which are apparently immune (Arran Crest, Di Vernon, Epicure, Sharpe's Express). None of the varieties tested contracted the disease when the inoculation was made by needle punctures, with the exception of Arran Victory, which was successfully infected with inoculum derived from plants of the same variety in which infection was several years old.

Needle inoculation of para-crinkle into *Datura stramonium* gave negative results, except when the virus was obtained from a tuber-born diseased Arran Victory plant, or when the virus had been passed by grafting to *D. stramonium*, then through potatoes, and thence again to *D. stramonium* by needle; the symptoms thus produced were a mottling of the leaves which is distinct from that caused by crinkle 'A' in that it is more or less confined to the base of the leaf, is less vivid, and the pale areas lie immediately alongside the veins, almost completely fill in the interveinal spaces, and thus prevent the formation of the green lines characteristic of crinkle 'A'. The symptoms produced in *D. stramonium* by grafting are a diffuse, rather large mottling of the leaves which begins at the apex and is not associated with the veins; after some time

this mottling fills in the interveinal spaces. Later there develop numerous small, bright yellow spots, more or less densely clustered towards the apex of the leaf, a feature not observed in crinkle 'A'.

Double grafts of *D. stramonium* and potato, made on the same lines as with crinkle 'A', indicated that passage of the virus through a living solid *D. stramonium* stem, 2 inches long, had no effect on it; the virus was apparently destroyed, however, by passage through a *D. stramonium* stem bearing active leaves, the inference being that it was killed by the metabolic products of the plant. Two varieties of tobacco tested failed to react to the virus.

The paper also includes a discussion of the virus diseases problem in potatoes, and of the bearing of the discovery of the latent paracrinkle in the King Edward and President varieties on the theory that healthy potatoes can induce diseases of the virus type on inoculation into other plants.

ROTHER & MOELLER. **Auszug aus dem Jahresbericht der Deutschen Kartoffelkulturstation über die Ergebnisse der Anbauversuche 1929.** [Extract from the annual report of the German Potato cultivation station on the results of the growing experiments 1929.]—*Illus. Landw. Zeit.*, l, 10, pp. 140–142, 10 figs., 1930.

Particulars are given of the reaction to disease and other characters of a number of potato varieties tested at the German potato cultivation station during 1929. Modrow's Industrie proved fairly susceptible to late blight [*Phytophthora infestans*: *R.A.M.*, vii, p. 534] and scab [*Actinomyces scabies*: see above, p. 553], while the wart-immune [*Synchytrium endobioticum*] Erdgold (P.S.G.) [Pomeranian Seed Association] was heavily infected by *P. infestans* but only slightly by *A. scabies*. Böhm's wart-immune Ackersegen [ibid., viii, p. 123] again proved resistant both to late blight and scab, while the P. S. G. Cellini, also immune from wart, showed susceptibility to the other two diseases. The wart-immune Parnassia was moderately resistant to late blight but somewhat susceptible to scab [but see ibid., viii, p. 124], as was also P. S. G. Hutten and Kl. Spiegeler Wohltmann. In the wart-immune P. S. G. Sickingen the reverse was true. Paulsen's wart-immune Roland I proved somewhat susceptible both to late blight and scab.

SANDERSON (A. R.). **Some observations on the mildew leaf disease of Hevea brasiliensis due to Oidium heveae.**—*Quart. Journ. Rubber Res. Inst. Malaya*, ii, 1, pp. 16–30, 1930.

In this paper a brief semi-popular account is given of powdery mildew (*Oidium heveae*) of *Hevea* rubber, which is stated to occur throughout the rubber-growing areas of the Eastern tropics, with the exception of South India and Burma. In Malaya the disease has not yet done much damage, although in some cases the yield of seed has been adversely affected by heavy infection of the flowers. Control measures are also discussed.

Queensland. No. 11. An Act to consolidate and amend the law relating to diseases in plants, and for other purposes.— 15 pp., 1929.

By virtue of the Diseases in Plants Act of 1929 (assented to on 27th November and superseding the Diseases in Plants Acts, 1916 to 1924), the Governor in Council may from time to time prohibit or limit the importation into Queensland, or any portion thereof, from another State in the Commonwealth, of any tree, plant, or vegetable likely to introduce any insect, fungus, or disease; and he may likewise prohibit or limit the removal of any tree, plant, or vegetable from one orchard, nursery, or similar place to another. On or before a prescribed date in every year, every occupier or owner of a nursery shall furnish the necessary return of the registration of his nursery. Inspectors are empowered to detain suspected material and to enforce its destruction by the owner or occupier of the premises. In the case of abandoned orchards and nurseries the Minister of Agriculture may order the destruction of all plants likely to harbour or spread any disease or pest. The Governor in Council may further declare any area, situated wholly or partially within or outside a 'fruit district' duly declared as such, to be a quarantine area for the purposes of this Act, the quarantine in any such area being either general or in respect of a particular disease or pest. Within 24 hours (or such further time as may be prescribed) of the detection of any disease or pest, the occupier of the land or premises concerned shall give written notice thereof to the Department of Agriculture and Stock. Provision is made for compensation in respect of non-diseased trees, plants, or vegetables destroyed under official supervision.

Queensland. No. 12. An Act to make better provision for the protection of the Banana industry of Queensland, and for other purposes.—13 pp., 1929.

The Banana Industry Protection Act of 1929 (assented to on 27th November) provides for the registration of banana orchards by the owner or occupier on a specified date in every year. The Governor in Council may establish a Board, The Banana Industry Protection Board, consisting of four members, two representing the Government and two the banana growers. The duties and responsibilities of the Board include advising the Minister on such matters and measures for the control of bunchy top, leaf spot [*Cercospora musae*: *R.A.M.*, viii, pp. 256, 512, *et passim*], and other diseases. The Board may further be entrusted, by Order in Council, with the administration, either wholly or in part, of the Diseases in Plants Act of 1929 [see preceding abstract] in respect of (*a*) neglected or abandoned banana orchards, and (*b*) any quarantine area or special district as defined in the Diseases in Plants Act. Moreover, the Board may be authorized to take action in respect of the issue or refusal of permits to plant, of the removal of suckers, or of the clearing up of neglected banana orchards. Provisions are made for the appointment of a Chief Inspector for the purposes of the Act; for the establishment of a fund entitled The Banana Industry Fund; for the levy on banana growers of an assessment in a sum to be declared by the Governor

in Council; and for compensation in respect of non-diseased trees, plants, or vegetables destroyed for purposes of disease control under official supervision (except in the case of abandoned or neglected orchards). From time to time regulations may be made by the Governor in Council concerning the detention, examination, and (if necessary) treatment or destruction of suspected banana material; the declaration of quarantine in respect of bananas; and the prohibition or restriction of the removal of bananas from one place to another [loc. cit.].

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, ii, 5, pp. 222–224, 231–236, 1930.

Austria. As from 1st February 1930, all potato consignments imported into Austria must be accompanied by a duly authenticated official certificate guaranteeing their freedom from wart disease (*Synchytrium endobioticum*) and other pests and diseases, and a statement to the effect that wart disease does not occur in the place of origin or within a circuit of 15 km. from the locality in question. Full details are given of the regulations governing trading in potatoes at the frontiers, the passage of potatoes through the country, and other points of interest.

Introduction of Hop-sets into New Zealand prohibited.—*Journ. Min. Agric.*, xxxvi, 11, p. 1032, 1930.

This is a notification of the issue by the Governor-General of New Zealand of two Orders in Council, dated 11th November 1929, prohibiting absolutely the introduction into New Zealand of sets of any variety of hops of foreign origin, and declaring the downy mildew of the hop (*Pseudoperonospora humuli*) to be an additional disease to be included in the Orchard and Garden Diseases Act of 1928.

Gold Coast Colony. Orders by the Governor Nos. 19 and 20 of 1930.—2 pp., 1930.

By virtue of the Pests (Witch Broom Declaration) Order, 1930 (gazetted 17th May), the cacao disease known as witch broom (*Marasmius perniciosus*) is hereby declared to be an 'injurious pest' for the purposes of the Pests Ordinance [*R.A.M.*, vi, p. 703]. Under the Pests (Declared Plants) Order, 1930 (gazetted 17th May) any plant from Central or South America or the West Indies (where the disease is known to occur) [ibid., viii, p. 488; ix, p. 232] is a 'declared plant' for the purposes of the Pests Ordinance. As explained in a supplementary notice by the Director of Agriculture, these Orders amount practically to a prohibition of importation of any plant or part thereof, or any soil or package formerly containing soil or plants, originating in the above-mentioned countries, these drastic measures being necessary to exclude from the Gold Coast a most dangerous disease which has so far resisted all attempts at control.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

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HAUPTFLEISCH (K.). **Versuche zur Bekämpfung des Kartoffelschorfes durch Sortenwahl.** [Experiments in the control of Potato scab by varietal selection.]—*Pflanzenbau*, vi, 9, pp. 255–257, 1930.

A series of tests was conducted during 1928–9 in soils of different kinds in the Kiel district to determine the reaction of some commercial potato varieties to scab [*Actinomyces scabies*: *R.A.M.*, ix, p. 606]. The varieties used were Richter's Jubel, Ebstorfer Juliniere, Modrow's Blaupunkt, Modrow's Preussen (original and progeny), Modrow's Direktor Johanssen, and Böhm's Allerfrüheste Gelbe (all resistant to wart disease [*Synchytrium endobioticum*] except the last-named). Absolute immunity from scab was manifested only by Jubel in one locality where the soil was a permeable sand, with a high humus content, which had been limed in 1926, and during each year of the tests received an application of nitrogen and 3 doppelzentner nitrophoska per hect. The highest incidence of infection in all the varieties occurred in a light sandy soil with a hydrogen-ion concentration of P_H 8·5.

NIEUWPOORT (D.). **Optreden en bestrijding van Phytophthora op jonge oculaties.** [Occurrence and control of *Phytophthora* on young bud material.]—*De Bergultures*, iv, 13, p. 326, 1930.

Young *Hevea* rubber bud material, both in old gardens in which the budded plants were set out between the old trees, and in seed-beds, was observed, during the latter part of the rainy season of 1928–9, to be attacked by *Phytophthora* [? *palmivora*: *R.A.M.*, ix, p. 268], the affected plants being killed. Complete control was effected by spraying weekly with Bordeaux mixture (75 gm. lime and 100 gm. copper sulphate in 18½ l. of water), directions for the preparation of which are given.

RHODES (E.). **Brown bast. Some considerations as to its nature.**—*Quart. Journ. Rubber Res. Inst. Malaya*, ii, 1, pp. 1–11, 4 pl., 1930.

The author states that a study of the recent literature on the brown bast disease of *Hevea* rubber [*R.A.M.*, i, pp. 137, 140, 142;

iv, p. 187] in the light of Swarbrick's investigation of wound healing in trees [ibid., v, p. 503] led him to the conclusion that the whole work, thus envisaged, is rendered coherent and consistent and goes to show that the disease is closely related to the normal wound-healing reaction of the tree and obeys the same general laws as established by Swarbrick. This conclusion was confirmed by his own investigations of the histological and macro- and microchemical conditions in healthy and diseased *Hevea* cortex, which showed that the discoloration in brown bast is due to a deposition of the so-called wound gum, and that the substances which accumulate in the diseased bark are those which normally accumulate in the neighbourhood of wounds, while the only major decrease in the cell contents noticed was in the amount of starch, the disappearance of which was also observed by Swarbrick when wound gum deposition is proceeding.

Viewed in this light the mechanism of brown bast appears simple. As a result of tapping, a random and occasional dying-back or drying-out may occur in a latex vessel or group of vessels of the tree, which is followed by the deposition, when the enzyme system is active, of wound gum in the parenchyma surrounding the dying latex vessels to the point where the die-back stops. Should the die-back of the vessels extend further, the deposition of gum will follow it, and an extension of discoloration along the vessel system, such as is usual in brown bast, will result. Once started in this way, gumming is able under favourable conditions to spread along the vessel system both downwards and laterally, since the latex vessels in each ring frequently anastomose. Subsequent events are governed by the universal conditions for wound gum formation, one of which is activity of the enzyme system normal to the tree, in dependence on which gumming can be very rapid or very slow.

The linking of the disease with enzyme activity and vigour of the tree supplies a simple explanation of many obscure but fundamental points connected with its incidence and throws a new light upon the correlation between brown bast trees and dry trees in small holdings.

Yoshii (H.). **A leaf spot or blight disease of Ricinus communis L., caused by Macrosporium ricini.**—*Bul. Sci. Fakultato Terkultura, Kjusu Univ.*, iii, 4, pp. 327–332, 1 pl., 1929. [Japanese, with English summary. Received July, 1930.]

A description is given of a leaf spot or blight of the castor oil plant (*Ricinus communis*), characterized by the production of irregular cinnamon-buff spots, 10 to 20 mm. in diameter, on the leaves, interspersed with irregular tawny-olive zones, often surrounded by an etiolated halo. The causal organism, *Macrosporium ricini* n. sp., possesses simple or branched, stout, light brown to olivaceous, 1- to 4-celled conidiophores, arising singly or in fascicles from the diseased tissues and measuring 30 to 60 by 5·5 to 7 μ: the conidia, borne singly at the tips of the conidiophores, are pale greenish-brown to dark olivaceous, fusiform to obclavate, with numerous transverse and longitudinal septa, 42 to 78 by 8·7 to 19·5 μ, and with hyaline, slender beaks, 30 to 100 μ

long by 1·2 to 1·8 μ broad. The pathogenicity of the fungus was demonstrated by successful inoculations on castor leaves.

UNAMUNO (L. M.). **Nueva aportación al estudio de la flora micológica del Concejo de Llanes (Asturias).** [New contribution to the study of the mycological flora of the Concejo de Llanes (Asturias).]—*Bol. R. Soc. Española Hist. Nat.*, xxx, 3, pp. 179–187, 1930.

The following fungi are of interest in this further contribution to the mycological flora of northern Spain [cf. *R.A.M.*, ix, p. 408], *Phoma exigua* [ibid., viii, p. 151], new to the Spanish mycoflora, was found on flax stems; the oval, biguttulate, hyaline spores measure 5 to 7 by 2·5 to 3 μ.

Hop leaves were infected by *Septoria divergens* Bub. et Kab.

Macrosporium heteronemum (Desm.) Kickx was observed on the leaves of *Colocasia antiquorum* in association with *Leptosphaeria colocasiae* Unam. [ibid., ix, p. 408].

YAMAMOTO (Y.). **Ein Beitrag zur Kenntnis der Gattung Rhizopus. I.** [A contribution to the knowledge of the genus *Rhizopus*. I.]—*Journ. Fac. Agric., Hokkaido Imper. Univ.*, Sapporo, Japan, xxviii, 1, pp. 1–101, 4 pl., 16 graphs, 1930.

The results are fully described of the author's extensive researches on the morphological and cultural characters and systematic position of the genus *Rhizopus*.

The fungi examined were placed in two sections (*Eurugorhizopus* and *Dubiorugorhizopus*), and six groups (*nigricans, oryzae, arrhizus, hangchow, albus,* and *chinensis*) [cf. *R.A.M.*, i, p. 433; ii, pp. 464, 564; iv, p. 700]. The *nigricans* group comprises *R. nigricans, R. reflexus,* and *R. artocarpi*; the *oryzae* group, *R. oryzae, R. tritici,* and *R. nodosus*; the *arrhizus* group, *R. arrhizus* [ibid, vii, p. 29]; the *hangchow* group, *R. hangchow*; the *albus* group, *R. albus, R. peka* I, and *R. shanghaiensis*; and the *chinensis* group, *R. chinensis, R. liquefaciens, R. pseudochinensis,* and *R. niveus*. Varieties of *R. oryzae* include *R. tonkinensis, R. batatas, R. delemar,* and others [which are listed]. *R. maydis* is considered to be a synonym of *R. arrhizus*, while *R. humilis* is a variety of *R. liquefaciens*.

Diagnoses of the above-mentioned 15 species are given.

DRECHSLER (C.). **Repetitional diplanetism in the genus Phytophthora.**—*Journ. Agric. Res.*, xl, 6, pp. 557–573, 1 pl., 1930.

The author gives a detailed account of the diplanetism exhibited by several species of *Phytophthora*, among which *P. parasitica, P. parasitica* var. *rhei*, the papillate form isolated from decaying potato tubers [*R.A.M.*, viii, p. 399], *P. cactorum, P. citrophthora,* and *P. melongenae* present both direct diplanetism (a second zoospore liberated from the encysted first one) and indirect (the second zoospore liberated from a small sporangium on a short germ-tube from the first). When the normal sporangium fails in part or wholly to release its zoospores, the latter after encystment often give rise to a free-swimming stage inside the sporangium; or germ sporangiophores perforate the sporangial wall or pass out through the papillary orifice to form minute secondary sporangia,

frequently giving a distinctive bristling aspect to the original sporangium.

The author also observed indirect diplanetism in various species of *Pythium* with filamentous and with lobulate sporangia (e. g., *P. butleri*), the encysted zoospore discharging its undifferentiated contents through a slender evacuation tube up to 25 μ in length into a small and very delicate vesicle, where a single motile spore is formed.

MES (MARGARETHA). **On the identity of Dematium scabridum Gilman and Abbott with the conidial form of Ceratostomella adiposum (Butl.) Sartoris.**—*Verh. K. Akad. Wetensch. Amsterdam*, Sect. 2, xxvi, 4, pp. 30–31, 1929. [Received May, 1930.]

A culture of *Dematium scabridum* Gilman and Abbott isolated from soil [cf. *R.A.M.*, vii, p. 57] developed, after a few months at the Centraalbureau voor Schimmelcultures, the black, spherical perithecia with long, thin beaks characteristic of *Ceratostomella adiposum* [ibid., vii, p. 272]. A comparison of this culture of *D. scabridum* with *C. adiposum* from the Imperial Bureau of Mycology revealed the identity of the two organisms, and hence there seems to be no reason to maintain the former as a separate species.

CURZI (M.). **Prime osservazioni su la mutazione di un ifomicete.** [First observations on mutation in a Hyphomycete.]—*Rendic. R. Accad. Lincei*, xi, Ser. 6, 5, pp. 506–508, 1930.

Two non-reverting saltations of *Fusarium moronei* Curzi [*R.A.M.*, viii, p. 37] were obtained from a monoconidial culture by selecting through several generations the sector having the most abundant aerial mycelium and that with the scantiest. The former method gave a strain which showed sporodochia, sclerotia, and echinulate, coloured, botryoid chlamydospores, while the latter gave one which formed pseudopionnotes and had hyaline, smooth, intercalary chlamydospores. When both strains were grown together, marked antipathy resulted, shown by the formation along the boundary line between the two colonies of a dark zone of branched, abnormally contorted hyphae with abundant aerial mycelium and free sporulation; this was very slight on poor media, but well marked on those rich in carbohydrate.

Both strains would fall into the section *Gibbosum*, the one with abundant aerial mycelium being placed in the subsection *Ferruginosum* and the other in the subsection *Eugibbosum*, very close to *Fusarium falcatum*.

SYDOW (H.) & MCRAE (W.). **Hyphomycetes Indiae orientalis. Pars I.** [East Indian Hyphomycetes. Part I.]—*Ann. Cryptog. Exot.*, ii, 3–4, pp. 262–271, 1929. [In German. Received May, 1930.]

In this paper brief notes are given on 51 species of *Cercospora* which have been collected in India within the last thirty years. Nine of these are considered to be new to science, and Latin diagnoses of them are given. The following, amongst others, are

of economic interest. *Cercospora asparagi* on the leaves and stems of asparagus; *C. batatae* on sweet potato leaves; *C. cannabina* on hemp leaves; *C. capsici* on chilli (*Capsicum annuum*) leaves; *C. dioscoreae* on leaves of species of *Dioscorea*; *C. dolichi* on leaves of *Dolichos lablab*; *C. foeniculi* on leaves, petioles, and stems of *Foeniculum vulgare* (the minor differences noted between the authors' specimens and Magnus's description are considered to be of no taxonomic importance, both being believed to be merely forms of the widely distributed *Fusicladium depressum* (Berk. & C.) Sacc., as are also, in all probability, *C. anethi* Sacc., *C. arracachae* Pat., *C. platyspora* Ell. et Holl., and *Marssonina kirchneri*); *C. hibisci* on the leaves of *Hibiscus esculentus*; *C. momordicae* McRae n. sp. on leaves of *Momordica charantia*, on which it forms rounded, amphigenous, at first yellowish, later whitish spots, 3 to 6 mm. in diameter, with a narrow darker margin; *C. penzigii* on leaves of *Citrus* species; *C. punicae* on leaves of pomegranate; *C. rosicola* on the leaves of different varieties of roses; *C. solani* on leaves of the eggplant and *Solanum nigrum*; *C. strychni* Syd. n. sp., on leaves of *Strychnos nux-vomica*, on which it forms amphigenous, irregular, frequently coalescing, greyish spots, 2 to 10 mm. in diameter, with a raised, dark brown linear margin; *C. trichosanthis* McRae n. sp., on the leaves of *Trichosanthes anguina*, on which it forms amphigenous, rounded or irregular, at first yellowish, later whitish spots, 2 to 5 mm. in diameter, surrounded by a raised, dark brown line; *C. ubi* on leaves of species of *Dioscorea*; and *C. viticola* on vine leaves.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc., Part 7. The results of successive cultures and selections within pure line of the fungus.**—*Bul. Sci. Fakultato Terkultura, Kjusu Univ.*, iii, 3, pp. 292–299, 1929. [Japanese, with English summary. Received July, 1930.]

Continuing his studies on *Sclerotium rolfsii* [*R.A.M.*, vii, pp. 120, 121], the writer made successive selections of sclerotia of mean diameter and of those above and below the mean as developed in Czapek's agar by the progeny of a pure strain of the fungus. The size of the sclerotia was found to show a gradual decrease in successive selections, this tendency being more pronounced in selections from the smaller than from the larger sclerotia. The diminishing size of the sclerotia is attributed to the absence, in synthetic media, of a specific substance contributing to mycelial and sclerotial formation which occurs in natural media, e. g., koji agar. This substance appears to be analogous to the vitamin investigated by Willaman in *Sclerotinia cinerea* (*Journ. Amer. Chem. Soc.*, xlii, p. 549, 1920).

STEINMANN (A.). **Over het gebruik van chemische middelen bij de bestrijding van wortelschimmels.** [On the use of chemical substances in the control of root fungi.]—*De Bergcultures*, iv, 9, pp. 223–228, 1930.

Following on a general account of the incidence and distribution of root diseases of tea in the Dutch East Indies, the writer gives directions, based on the successful results of his own experiments,

for the control of *Rosellinia bunodes* by soil disinfection with alum, aluminium sulphate, or sulphur [*R.A.M.*, vii, p. 65].

KUYPER (J.). **Verslag van het Deli Proefstation over het jaar 1929.** [Report of the Deli Experiment Station for the year 1929.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. ii, lxv, 62 pp., 1 fig., 1930.

The following references of phytopathological interest occur in this report. Encouraging results in the control of slime disease of tobacco [*Bacterium solanacearum*] were again given by steam sterilization of the soil [*R.A.M.*, viii, p. 553], using the so-called 'box and grid' method. Careful inspection on several estates confirmed previous observations as to the increased incidence of slime disease in the field resulting from the use of infected material from the seed-beds. About eight successful crosses made at an altitude of 1,200 m. above sea-level between Deli tobacco and various resistant species of *Nicotiana* (other than *N. tabacum*) will be tested in the plain for resistance to slime disease.

Tests were made to determine the viability of the infectious principles of the mosaic, Rotterdam B, and 'vein streak' diseases of tobacco [ibid., vi, p. 444, and next abstract], the last-named having been detected in 1928. Nine-months-old dried plants were found to yield infectious material, especially in the cases of mosaic and vein streak. A disease characterized by circular spots on the leaves, long known in Deli but only recently recognized as due to a virus, is thought to be probably identical with the American ring spot [ibid., vii, p. 478 *et passim*].

The results of pot experiments showed that soil that is capable of inducing severe top rot [see below, p. 616] may become normal in the course of a few months. The disease was again very prevalent during 1929, especially on certain soils. Closely connected with top rot is the condition known as 'burnt hearts', which usually occurs in the field just after transplanting, but in 1929 was very prevalent in the seed-beds, apparently for the first time. Another form of top rot was found to be due to a bacterium, inoculation experiments with which gave positive results. This is believed to be the same organism as that responsible for 'drip stalk' of cured tobacco.

In a mixed plantation of sago [*Arenga saccharifera*] and *Areca* [*catechu*] palms, the latter were attacked by a disease thought to be probably koleroga, due to *Phytophthora* [*arecae*: ibid., vii, p. 602], causing destruction of the growing point and ultimate death of the palms.

Pythium stem scorch [ibid., viii, p. 226] was very prevalent, especially in land in which tobacco is grown every year. Where this disease occurs rotation appears to be very necessary.

JOCHEMS (S. C. J.). **Twee nieuwe virusziekten bij Deli-Tabak (ringvlekziekte en nerfstreep).** [Two new virus diseases of Deli Tobacco (ring spot disease and vein streak).]—*Bull. Deli Proefstat. te Medan-Sumatra*, 30, 24 pp., 2 pl., 1930. [English summary.]

The symptoms of two diseases of Deli tobacco that have recently

been shown to belong to the group of virus diseases, viz., ring spot and vein streak [see preceding abstract], are fully described, with notes on their distribution and economic importance, and on the results of inoculation experiments.

Ring spot is usually restricted to a small number of plants in the field, and causes little damage. It is, however, prevalent on all types of soil throughout the tobacco-growing district. Transfer of infection was readily accomplished by crushing the young top leaves of healthy plants with fingers dipped in the expressed juice of the tops of diseased individuals. The symptoms developed after an interval of about 16 days. The largest number of plants contracting infection by this means was 8 per cent., this low figure agreeing with the usual scarcity in the field. Ultimately the diseased leaves become covered with large spots and very brittle, so that they cannot be used for wrappers. The entire plant is, therefore, valueless, and should be eradicated to prevent further infection.

Vein streak was only observed once, in a selection experiment in which one plot was almost completely diseased. That the condition is not hereditary was shown by the fact that another plot in the same experiment from the same seed, planted ten days later, was free from the slightest symptom. The disease is evidently very infectious, as in all inoculation experiments nearly 100 per cent. of the plants treated as described under ring spot developed the typical symptoms, mostly after seven days. Besides the narrow light grey to brown necrotic streaks found on the older leaves parallel with the main veins and occurring on the latter themselves, the younger top leaves showed a mottling closely resembling ordinary mosaic but with more diffuse spots. Necrotic streaks are not found on these young leaves. Severely infected plants are dwarfed, and the leaves are turned down and present a blistered upper surface; sometimes one lateral half of the leaf is more affected and deformed than the other. Diseased leaves are useless for wrapping purposes.

Fukushi (T.). **On the mosaic disease of Tobacco.**—*Journ. Plant Protection*, xvi, 4, pp. 217–232; 5, pp. 269–276; 6, pp. 333–339; 7, pp. 385–392, 1929. [Japanese. Received July, 1930.]

A detailed account is given of the mosaic disease of tobacco, which has been known in Japan since 1857. The literature is fully summarized, the symptoms, pathological anatomy, host range, and nature of the virus are described, and hypotheses concerning the cause of tobacco mosaic are critically reviewed.

Fukushi (T.). **On the cause of the Tobacco mosaic disease.**—*Agric. & Hort.*, iv, 11, pp. 1273–1283, 1929. [Japanese. Received July, 1930.]

This is a critical review of the hypotheses concerning the cause of tobacco mosaic.

Kuyper (J.). **Boorzuur tegen de topziekte van de Tabak.** [Boric acid against top disease of Tobacco.]—*Deli Proefstat. te Medan Sumatra Vlugschr.* 50, 7 pp., 1 pl., 1930.

The results of field experiments [details of which are given] in

the control of top rot of tobacco [*R.A.M.*, vi, p. 445, and above, p. 614] in Deli, Sumatra, showed that the application to the plants of a boric acid solution (3 mg. of boric acid per 1 l. of water) is very effective for this purpose. The cost of the treatment is very low.

v. B. **Wortelkraag-ziekte op Succirubra-zaadbedden.** [Root collar disease on *Succirubra* seed-beds.]—*De Bergcultures*, iv, 9, p. 218, 1930.

Brief notes are given on two types of root-collar disease, apparently of physiological origin, of *Cinchona succirubra* seedlings in Java [cf. *R.A.M.*, ix, p. 431]. One is characterized by a desiccation and swelling of the bark of the root collar just above or below soil level, accompanied by an autumnal discoloration of the leaf crown. The other form, which was observed by the writer in a seed bed on seedlings not exceeding 1 mm. in stem diameter, is manifested by a desiccation of the stems at the juncture of the aerial and underground parts of the plant. In this form of disease it may be some time before the affected seedlings show any external symptoms on the foliage, but during the transition period they show a marked tendency to droop and eventually collapse, presenting the appearance of a field damaged by hail. On examination, the diseased plants seem to be snapped off at the root-collar, just at the point where the root ends and the stem begins. In the case under observation it was necessary to uproot the diseased patch, leaving the cavities exposed to light and air.

A[NDERSON] (M. L.). **A case of 'damping-off' induced by the use of wood-ashes as a manure on seed-beds.**—*Scottish Forestry Journ.*, xliv, 1, pp. 7–16, 2 graphs, 1930.

The results of experiments [brief details of which are given] in 1925 at the Inverleith forest nursery, Edinburgh, showed that wood ashes applied as a manure to seed-beds before sowing considerably increased the incidence of damping-off associated with a species of *Fusarium* in seedlings of Scots pine [*Pinus sylvestris*] and Sitka spruce [*Picea sitchensis*]. Hardwood ashes appeared to be more injurious than softwood ashes, since the damping-off losses in beds dressed with the former were 36·7 per cent. in Scots pine and 8·4 per cent. in Sitka spruce, as compared with 26 and 4·5 per cent., respectively, when softwood ashes were used, and 6·3 and 1·28 per cent., respectively, in the control beds. The author considers that the use of wood ashes is not to be recommended just before or during the sowing of the seed of these trees, although the ashes are a valuable potassic manure when applied in small doses as a dressing after the seedlings are a month or two old.

SCHIMITSCHEK (E.). **Die Krankheiten und Feinde de Douglastanne.** [The diseases and pests of the Douglas Fir.]—*Centralbl. für das ges. Forstwesen*, Vienna, lvi, 4, pp. 130–140, 1930.

Notes are given on the following fungous diseases attacking the Douglas fir [*Pseudotsuga taxifolia*]: *Phomopsis pseudotsugae* in various European countries [*R.A.M.*, viii, p. 278]; *P. conorum*, occurring in a secondary capacity on trees injured by frost;

Rhabdocline pseudotsugae in Great Britain, Ireland, and the United States [ibid., vi, p. 702 ; vii, pp. 482, 483] ; *Moniliopsis klebahni*, which causes the collapse of Douglas fir and other conifer seedlings, completely destroying the cells of the stem as far as the wood vessels ; *Dasyscypha willkommii* in America ; and *Botrytis cinerea*, which causes heavy damage to the blue varieties [ibid., vi, pp. 447, 764] of Douglas fir.

In addition to the above-mentioned fungi, reference is made to Gaümann's recent report (*Schweiz. Zeitschr. für Forstw.*, p. 63, 1930) on the occurrence in Switzerland of a species of *Adelopus*, possibly identical with *A. balsamicola* which has been known for the last 30 years on *Abies* spp. in England [ibid., viii, p. 275], France, and Czecho-Slovakia. The Swiss fungus is stated to occur also in England and Ireland on Douglas firs. The chief symptom is the extensive loss of needles, beginning with the older ones and finally involving all but those of the current and previous year. The disease affects 20- to 30-year-old trees, which show a yellowish discoloration in March, followed by a yellowish-green spotting of the needles in May. The black, punctiform perithecia develop from May till the autumn along the stomata on the under side of the needles, which fall when the perithecia reach maturity in August.

Cartwright (K. St. G.). **A decay of Sitka Spruce timber, caused by Trametes serialis Fr. A cultural study of the fungus.**— *Dept. of Sci. & Indus. Res., Forest Products Res. Bull.* 4, 26 pp., 6 pl., 1 graph, 1930.

This is a detailed morphological and cultural account of *Trametes serialis*, which preliminary investigations showed to be the principal cause of brown pocket rot in Sitka spruce [*Picea sitchensis*] timber imported into England from North America [*R.A.M.*, viii, p. 689], since it was found in about 90 per cent. of the samples studied by the author. Isolations also yielded three other species of Basidiomycetes, namely, a fungus closely resembling *Polyporus schweinitzii* in culture, but slightly differing in colour range and in the pronounced odour of young cultures ; a fungus forming numerous bulbils and with mycelium abundantly provided with clamp-connexions, which was identified as *Corticium alutaceum* (now transferred to *C. radiosum*) ; and an unidentified fungus, believed to be a species of *Exidia*, which formed sclerotium-like bodies, probably of the nature of abortive sporophores.

On artificially infected blocks of Sitka spruce wood, *T. serialis* usually formed fruiting bodies of the thelephoroid type, consisting of loose plates, ranging in colour from cartridge buff and pale ochraceous salmon to cinnamon brown, and darkening on ageing and bruising. *Irpex*, *Hydnum*, *Daedalea*, and *Poria* types of sporophore also occurred. All the fruit bodies had a normal hymenial surface with basidia bearing two to four spores, measuring 5 to 6 by 2·5 to 3 μ, on sterigmata from 2 to 5 μ in length. A xylose medium proved the most satisfactory of the synthetic media tested, but good growth was obtained on Kepler's malt extract agar, which has a constant P_H value without correction ; on this medium the fruit bodies were mostly of the foliose

type. The optimum temperature for growth was near 25° C., none occurring at 4°, while at 35° the growth was very slight. *T. serialis*, like some other wood-destroying fungi, is intolerant of an alkaline culture medium, a fact which has been taken into consideration in experiments on wood preservatives, although during growth the substratum was found to become more acid. The results of experiments to determine the water requirements of the fungus (in which blocks of Sitka spruce, whose air-dry weight had been ascertained, were placed in tubes, and varying amounts of water were added in each) indicated that the optimum water content for the development of the rot lies between 40 and 70 per cent. of the weight, the greatest loss of weight having occurred at a content of 43·7 per cent.

The investigation showed that the decay induced by *T. serialis* in Sitka spruce timber is of a very subtle nature, no discoloration being usually observable until the attack is in an advanced stage, and hyphae occasionally extending a long way beyond the discoloured areas. In the experimental blocks, the mode of entry appeared to be usually through the cut ends, although the fungus is also able to penetrate through the sides. The hyphae grow longitudinally in the tracheids at first, but on reaching an area of optimum moisture content they penetrate the walls of the vessels, probably by means of enzyme secretion. Brittleness of the wood is thought to be caused at an early stage of infection, and any sample of wood showing signs of brittleness or discoloration, although apparently normal in all other respects, should be regarded with suspicion for all purposes where strength is important.

Lutz (L.). **Nouvelles expériences sur la spécificité des champignons Hyménomycètes lignicoles vis-à-vis de leurs supports.—Sur la spécificité du Corticium quercinum.** [Further experiments on the specificity of lignicolous species of Hymenomycetes in regard to their substrata.—On the specificity of *Corticium quercinum*.]—*Bull. Soc. Myc. de France*, xlv, 4, pp. 261–263, 1930.

Continuing his studies of the specific relations of wood-attacking Hymenomycetes to their hosts [*R.A.M.*, viii, p. 745], the author briefly describes experiments in which he succeeded in inducing *Corticium quercinum* to grow on a number of species of wood belonging to widely different families, and on which under normal conditions the fungus refuses to develop ; this result was obtained by subjecting the blocks of wood tested to one or several lixiviations in water at 120° C. for 15 minutes, a process which is believed to remove from the wood the substances antagonistic to the growth of the fungus. On two of the woods, namely, those of *Newtonia insignis* and *Didelotia africana*, *C. quercinum* produced a normal hymenium with basidia, sterigmata, and basidiospores, but on the first-named the fructification was more of a *Stereum* than *Corticium* type, and had a slightly purplish-red colour, while on *Didelotia* it took the form of a crust adpressed to the substratum, slightly greenish-yellow in the middle and gradually darkening to a dark purplish grey towards the margin. These colours are very different

from that of *C. quercinum* on oak wood, and, together with the other macroscopical features of the hymenium on these two woods, show that the nature of the substratum exerts a certain influence on the morphological characters of the fungus.

Lobik (A. I.). О домовом грибе на Северном Кавказе. [Note on the house fungus in North Caucasus.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, v, pp. 169–172, 1930. [German summary.]

In this brief note the author points out the exceptionally heavy damage now being done by timber-rotting fungi, among which *Merulius lacrymans* is the most dangerous and widespread, in houses and other constructions not only in the larger towns but even in small villages and settlements in North Caucasus. This is due, to a great extent, to the highly insanitary conditions of many existing buildings, which serve as infection foci, and to the use of unseasoned and infected timber in new construction. It is recommended that all buildings should be carefully inspected and repaired where necessary, and that a strict control should be exercised over all timber used in new erections.

Rhodes (F. H.) & Gardner (F. T.). **Comparative efficiencies of the components of creosote oil as preservatives for timber.**—*Indus. & Engin. Chem.*, xxii, 2, pp. 167–171, 2 diags., 3 graphs, 1930.

The method used in the writers' tests of the comparative efficiency of the components of creosote oil was a modification of that devised by Reeves (*Proc. Amer. Wood Preserv. Assoc.*, xxiv, p. 42, 1928). Three grams of mechanical wood pulp (Norway spruce) [*Picea excelsa*] were disintegrated, suspended in water, and the suspension filtered through a muslin disk on a Büchner funnel. The pad was compacted by pressing and then dried at room temperature for 24 hours. The disk of dry pulp was uniformly saturated with 10 c.c. of a solution containing a known amount of the preservative dissolved in ether, dried in the air for 30 minutes, and placed in a Petri dish on top of a malt agar culture of *Fomes annosus* [*R.A.M.*, ix, pp. 149, 150], a large watch-glass being inverted over the dish, which was placed in a shallow basin of water and incubated at 25° C. In the absence of preservatives, the white mycelium of the fungus appeared in a few days, quickly followed by a brown stain covering most of the surface. Complete inhibition was indicated when no development occurred after a month. Disks of pulp treated with ether alone permitted equally rapid growth of the fungus with the untreated controls.

Thirty gallons of creosote oil were extracted at 60° C. with two successive portions, of 12 gallons each, of a 10 per cent. solution of sodium hydroxide. The resulting carbolate was reserved for the recovery of tar acids. The treated oil was then agitated with two successive portions, of 3 gallons each, of 30 per cent. sulphuric acid, the separated acid solution being set aside for recovery of the tar bases. The final extracted oil was washed with several portions of a 10 per cent. solution of sodium hydroxide and with 30 per

cent. sulphuric acid, and separated into ten fractions by distillation through a 10-inch Hempel column. The combined carbolate extract was washed twice with 1·5 gallon portions of benzene, steamed to remove residual benzene, blown with carbon dioxide until almost neutral, and acidified with hydrochloric acid. The liberated tar acid was separated, dried, and fractionally distilled. The solution obtained by extracting the oil with sulphuric acid was washed with benzene and made strongly alkaline with sodium hydroxide. The separated tar bases were dried and fractionally distilled.

Each of the fractions of dead oil, tar acid, and tar base was tested for fungicidal efficiency, as described above. The toxic limits [some of the data on which are given] were ascertained in two limiting concentrations, the higher just sufficient and the lower just insufficient to prevent the growth of the fungus. The toxic limits of a few of the pure hydrocarbons present in the oil were also determined as follows: naphthalene 0·5 to 1 per cent. by weight of pulp; α- and β-methyl naphthalene 0·5 to 1 per cent.; diphenyl 0·5 to 1 per cent.; and acenaphthene 1 to 2 per cent.

Further experiments [which are fully described] on the volatilities of the various components and the vapour pressure of fractions of creosote oil indicated that the presence of a proper amount of high-boiling material (fluorene) increases the fungicidal efficacy of a low-boiling material (naphthalene or diphenyl), although the less volatile substance may of itself have little preservative action.

Ducomet (V.). **La mosaïque de la Betterave et la selection.** [Beetroot mosaic and selection.]—*Bull. Assoc. Internat. Sélectionneurs de Plantes de Grande Cult.*, Gembloux, ii, 2, pp. 44–48, 4 pl., 2 figs., 1929. [Abs. in *Resumptio Genetica, 1930*, iv, 5, p. 242, 1930.]

This is a study of the effects of mosaic in beet seed-bearers on successive generations of the progeny [*R.A.M.*, ix, p. 355]. The transmissibility of the disease by the seed and by infection (by means of aphids) has been clearly demonstrated, although experimentation along these lines is hampered by the frequent delay in the external development of the symptoms.

Müller (K. R.). **Ergebnisse einiger Versuche zur Bekämpfung des Zwiebelrotzes.** [Results of some experiments in the control of the slime disease of Onions.]—*Deutsche Landw. Presse*, lvii, 10, p. 129, 4 figs., 1930.

The writer's experiments in the control of the 'Rotzkrankheit' of onions [the symptoms of which are briefly described: *R.A.M.*, ix, p. 129] indicate that the application of a complete fertilizer strengthens the plants and enables them to resist infection, while unbalanced nitrogen or potash are undesirable. It is very important that only firm onions should be used for 'seed'. Good results have been obtained by 15 minutes' immersion of the seed in 0·75 per cent. potassium permanganate or 0·4 per cent. uspulun.

Hansen (H. N.). **Segregation (?) in Phoma terrestris.**—*Science*, N.S., lxxi, 1842, p. 424, 1930.

In connexion with a recent study of the pink-root disease of onions (*Phoma terrestris*), the writer found that while all the fungi isolated from infected roots in various parts of the United States apparently belonged to the genus *Phoma*, and were capable of causing the typical symptoms, they differed considerably in such morphological and cultural characters as abundance, shape, and size of pycnidia, number and length of ostioles, colour of mycelium and substratum, and growth rate [*R.A.M.*, ix, p. 155]. No perfect stage has been observed either in nature or in culture. Extensive culturing during the past five years on a large variety of media failed to show any sector formation. A close study of the California organism showed that if constant spore-mass transfers were made through several generations, pycnidia were produced earlier and in much greater abundance than by mycelial transfers, indicating a dissimilarity between the genetic constitutions of spores and hyphae, so that monospore cultures might be expected to differ in some degree from the parent culture. This was actually found to be the case. Of 50 monospore cultures from the California organism, 42 were pink like the parent and the remainder almost black. Succeeding generations of the pink form gave both pink and black in various proportions ranging from 10 to 36 per cent. black, with an occasional individual producing only pink progeny; this shows that, as regards culture coloration, there are homogenic individuals of both the dominants and the recessives. The fact that *P. terrestris* breaks up into variants when monospore cultures are made indicates the occurrence of segregation of character factors, and its constancy when perpetuated by mycelial transfers denotes that segregation takes place during pycnidial formation or spore maturation.

Salmon (E. S.) & Ware (W. M.). **Root rots of Asparagus.**—*Gard. Chron.*, lxxxvii, 2258, p. 275, 1 fig., 1930.

Early in February, 1930, the writers received specimens of diseased asparagus roots from a grower at Penshurst, Kent. Many of the fleshy roots developing from the rhizome were dark brown and apparently dead. The cortex of these roots was brown, but the rest of the tissues were apparently healthy. The diseased organs bore the round, black perithecia, just visible to the naked eye and occurring chiefly near the base of the root close to its junction with the rhizome, of *Zopfia rhizophila*, of which this appears to be only the second record in England [*R.A.M.*, vi, p. 593]. The asci measured 116 to 180 by 90 μ and the ascospores (hyaline until maturity, then deep brownish-black) were 64 to 80 by 38 to 48 μ, and slightly constricted at the septum. Although the parasitism of the organism is not yet proved, its association with the diseased roots, in the absence of any other fungus, certainly suggests its implication in their decay.

About the same time some asparagus rhizomes attacked by *Helicobasidium purpureum* (*Rhizoctonia crocorum*) [ibid., ix, pp. 219, 223] were received from a garden at Wye. The whole of the interior of the roots was rotten, leaving only the empty tube

of the outer part. Both the purplish mycelial stage and sclerotia were found near the place of attachment of the roots to the rhizome.

Leach (R.) & Wright (J.). **Collar and stem canker of (Cajanus indicus) Pigeon Pea, caused by a species of Physalospora.**— *Mem. Imper. Coll. Trop. Agric. Trinidad* (Mycol. Ser.), i, 12 pp., 4 pl., 1930.

A full account is given in semi-popular terms of a collar and stem canker of pigeon pea (*Cajanus indicus*) in Trinidad. The primary symptoms are the formation of grey, scutiform, dark-edged lesions averaging 5 cm. long on the stem and branches. Many of the lesions turn dark brown, and at the collar they generally change into large deep cankers with a verrucose, carbonaceous surface. Usually a canker at the collar girdles and kills the plant. A diagnostic character is the unequal development of the wood near the lesions, which gives the stem a twisted appearance. In later stages, discoloration of the internal tissues sometimes extends from a canker for a distance several feet along the stem.

Pycnidia of a *Phoma* and a *Macrophoma* type, which were shown to be the imperfect stages of a *Physalospora*, were found in young lesions, and inoculations with cultures of this and of various other fungi found on diseased plants established that the *Physalospora* was the cause of the disease. A *Diplodia* with spores measuring 18·9 to 30·4 by 11·6 to 13 μ (average 22·3 to 11·9 μ) also produced local cankers at the collar, and this fungus is thought to have induced the carbonaceous appearance in the collar cankers caused by the *Macrophoma*, their rapid enlargement probably being due to the combined action of both fungi. The presence of numerous acervuli of a *Myxosporium* in twigs killed by the Ascomycete also suggested combined fungal action.

The *Phoma* pycnidia were papillate, variable in size and structure, united into a stroma in culture, but found singly in the plant tissues. They contained on the whole of the inner surface minute conidiophores, bearing hyaline, obtuse conidia from 3·1 to 6·2 μ long (average 4 by 1·6 μ).

The *Macrophoma* pycnidia were similar but not papillate. The elongate, subellipsoid to subrhomboid, obtuse conidia measured 18·5 to 35 μ in length and averaged 24·5 by 7 μ. They were hyaline, with non-vacuolated granular contents, and had a mucilaginous envelope.

The perithecia were coriaceous, globose, and short-beaked, varying when mature from 164 to 226 μ in diameter. They contained basally borne, clavate-cylindrical, apically thickened asci, 126 to 134·8 μ long by 25 to 35 μ broad. The ascospores were extruded in a gelatinous matrix through a pore formed by the splitting off of an apical cap, and were fusoid-elliptical, with thick walls, hyaline, with one to three central vacuoles; they measured from 17·5 to 28 by 8·7 to 12·3 μ (average 24 by 11·1 μ).

Cultural studies are briefly described, the authors stating that, provisionally, they regard the fungus as closely related in the perithecial and pycnidial stages to *P. cydoniae*.

Brief recommendations are made for control.

Costantin (J.). **Culture du Pleurotus eryngii en 1929.** [Cultivation of *Pleurotus eryngii* in 1929.]—*Bull. Muséum National Hist. Nat.*, Paris, 2e ser., ii, 3, pp. 301–303, 1930.

The author gives some details of the progress of the artificial stations of *Pleurotus eryngii* established by him in 1924 in the forest of Fontainebleau and in experimental plots in the same neighbourhood [*R.A.M.*, viii, p. 259]. He mentions the long time (about 17 months) necessary for the establishment of the fungus and the appearance of the first mushrooms, and emphasizes the need for a careful supervision of the stations at all times, since the season of development of the mushrooms varies according to the rainfall and air temperature. He states that in 1929 several of his stations yielded a very satisfactory crop of this excellent edible species.

Beaumont (A.) & Hodson (W. E. H.). **Sixth Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30, 1929.**—28 pp., 1930.

This report contains, among others, the following items of interest on the prevalence of plant diseases in the south-west of England during the period under review. *Dilophospora alopecuri* [*R.A.M.*, viii, p. 300] was twice found on oats; in one case a thirteen-acre field was sown in October and grew well, the disease later appearing in patches corresponding with areas of bad drainage. Nearly two acres were spoiled in this way. Wart disease [*Synchytrium endobioticum*] of potatoes was noted for the first time in Cornwall, at St. Austell. The virus disease, stipple-streak, ruined more than an acre of Arran Consul potatoes in Devonshire. *Phoma lingam* was very prevalent on swedes in North Devon in the autumn of 1928. Mangolds were only slightly affected by black leg (*P. betae*), most of the crops recovering. Three centres of sugar-beet cultivation were affected by *Pythium de Baryanum*, but at two of them the plants recovered; seed disinfection gave no control.

No definite evidence was obtained in support of the view that any relationship exists between the date when potatoes are sown and subsequent susceptibility to blight [*Phytophthora infestans*]. During May and June, 1929, there were two periods when the atmospheric conditions prevailing over Devon favoured infection [ibid., v, p. 627]; the necessary conditions were present on 1st July, but no rain fell from the 5th to the 17th of the month, and blight did not become general in South Devon until the first week in August, the requisite conditions being present again on 28th and 30th July, and 1st to 6th August.

The following fungi were isolated from narcissus bulbs showing rotting of the scales from the neck downward, the base remaining healthy, viz.: *Fusarium moniliforme* [*Gibberella moniliformis*], *F. moniliforme* var. *maius*, *F. solani*, *F. bulbigenum* [ibid., v, p. 343], *Cylindrocarpon album*, *Ramularia macrospora*, and *F.* spp. The disease of narcissus bulbs characterized by a dry, brown decay of the root-plate, the scales remaining healthy, is now termed 'root-plate rot'; *R. macrospora* was frequently isolated from the affected bulbs. A similar trouble was also noted, in which there

was no decay of the bulb, but the roots had almost or quite disappeared; the plants did not appear to be diseased, but they made little progress. White root rot of narcissus [ibid., viii, p. 628], provisionally attributed to *Rosellinia necatrix*, causes large bare patches to appear in the field; the plants on the outside of the circle are easily pulled up, and the bulbs show symptoms closely resembling basal rot. The bulbs in the centre of the patch may be completely decayed, the outer scales are blackened, and a section shows a marbled white appearance, due to the distribution of the plates of mycelium. The disease usually occurs after the autumn rains.

Narcissus fire (*Botrytis polyblastis*) [ibid., viii, p. 41] is now fairly common in west Cornwall and the Scilly Islands, and was found in 1929 in Devon.

Notes are given on the following diseases of gladiolus corms present in England: hard rot (*Septoria gladioli*), dry rot (*Sclerotium gladioli*), scab (*Bacterium marginatum*), and storage rot (*Penicillium gladioli*). Tests indicated that *Septoria gladioli* may to some extent be controlled by transplanting inspected corms in fresh soil; disinfectants also reduced the amount of disease, unless the corms were badly attacked.

JØRSTAD (I.). **Beretning om plantesykdommer i land- og hagebruket. VI. Sykdommer på korn- og engvekster.** [Report on plant diseases in agriculture and horticulture. VI. Diseases of cereals and meadow grasses.]—Oslo, Grondahl & Sons Boktrykkeri, 84 pp., 1930.

A detailed account is given of the diseases of cereals, meadow grasses, and fodder crops (clover and lucerne) occurring in Norway, with special reference to those observed during the period covered by this report (1924–29).

Calonectria graminicola is probably the primary cause of winter injury to rye, which was very severe in 1922 and 1926. Squarehead wheat was attacked by this fungus in the spring of 1920. Straw fusariosis (*Fusarium* spp.) is of general occurrence on all kinds of cereals; instances of soil infection on barley, oats, and wheat have frequently been observed. *Gibberella saubinetii* has been found to cause fusariosis of the axes of oats, barley, and other cereals; the so-called 'sprouting fusariosis', a source of heavy damage, is to a great extent a direct sequel to the foregoing. Of these diseases, only *C. graminicola* and 'sprouting fusariosis' are amenable to seed treatment; cultural measures and varietal selection are indicated in the other cases.

Ophiobolus graminis has apparently only been found once in Norway, on spring wheat in August, 1920. *Leptosphaeria herpotrichoides* has not actually been determined as the cause of foot rot of cereals in Norway, but is thought to be undoubtedly implicated in the etiology of this disease. Species of *Alternaria* and *Rhizoctonia*, as well as *Helminthosporium sativum*, can also cause root rot of older plants.

Ophiocladium hordei Cav. produces dark spots, bearing a white or pale pink coating formed by the conidiophores of the fungus, on barley leaves.

Septoria culmifida (the pycnidial stage of *L. culmifida*) produces on the leaves and awns of barley and various grasses [*R.A.M.*, iii, p. 583] small, often angular spots with pale centres (occupied by the black pycnidia of the fungus) and brown edges. In the north of Norway *S. culmifida* often occurs in profusion with *Rhynchosporium secalis* [ibid., ix, p. 298]. The Maskin variety of barley appears to be particularly susceptible to *S. culmifida*. Disinfection of the seed-grain has not proved effective.

S. avenae (pycnidial stage of *L. avenaria* Weber) [ibid., ii, p. 159 ; vi, p. 272] forms good-sized, brownish to reddish lesions bearing small, dark pycnidia on oat leaves [ibid., vi, p. 336]. *S. secalis* has been found in various places in the east of the country on old rye leaves [ibid., iv, p. 396]. Neither of these fungi is of much importance.

Metasphaeria avenae (Auersw.) Sacc. (syn. *L. avenae* Auersw.) was observed on the leaf sheaths of oats in 1910.

Notes are given on the symptoms and control of some non-parasitic diseases of cereals, such as bright [grey] speck [ibid., viii, p. 751], yellow tip [reclamation disease: loc. cit.], and the like.

A bibliography of 124 titles is appended.

GREVE (M.). **Plantesygdomme og Skadedyr, deres Forekomst og Skadelighed.** [Plant diseases and pests, their occurrence and injuriousness.]—*Ugeskr. for Landmaend*, lxxv, 15, pp. 225–228, 1930.

During the period 1925–28 (inclusive) the writer conducted a survey of the incidence of fungous and physiological diseases and insect pests of some economic crops in four localities near Copenhagen, with a view to ascertaining the extent of the damage and losses due to these causes. The total area inspected in 1925 was 903 hect., the corresponding figures for 1926, 1927, and 1928 being 750, 354, and 492, respectively. In 1925 the combined losses from diseases and pests were estimated at Kr. 14 per hect., the corresponding figures for the three following years being 23, 29, and 14, respectively.

ŠKORIČ (V.). **Bolesti bilja ne fakultetskom dobru 'Maksimir'.** [Plant diseases at the University Farm 'Maksimir'.]—*Rapp. Ann. Univ. de Zagreb 1929*, pp. 738–746, 1930. [English summary.]

In this paper brief notes are given on 6 bacterial, 87 fungal, and 4 virus diseases of economic plants which were observed from 1922 to 1928 at the Zagreb University Farm 'Maksimir' [Jugo-Slavia], and among which the following are the most interesting. *Pseudomonas* [*Bacterium*] *phaseoli* [*R.A.M.*, ix, p. 151] broke out with considerable severity on dwarf beans [*Phaseolus vulgaris*] in 1923 and 1924; many of the plants attacked were killed outright, and in a fair proportion of cases the organism invaded the pods and the seeds. *Bacillus lathyri* [ibid., ix, p. 629] was recorded on peas for the first time in 1927, and reappeared with great severity in 1928, when the majority of the infected plants were killed; some plants, however, put forth a few new shoots from the collar,

which produced a small quantity of pods, most of which, with the enclosed seeds, were badly infected.

A few young beech seedlings were killed in 1924 by *Phytophthora omnivora* in the University nursery [ibid., vii, p. 290]; in 1925, however, the percentage of infection in the same beds was 60 to 70, with a high rate of mortality except in the seedlings which succeeded in developing the first pair of leaves, most of which recovered. *P. syringae* [ibid., viii, p. 108] occurs every year on lilac bushes, killing many young shoots and blossoms, and occasionally older branches. Downy mildew of hops (*Pseudoperonospora humuli*) was recorded on wild hops for the first time in 1925, but the indications were that the fungus was already of long standing on this host. The mildew was found to overwinter in the dormant buds of wild hops which in the following spring produce foreshortened and thickened shoots, all the tissues of which, including the pith, are permeated with mycelium of the fungus. Cultivated poppy [*Papaver somniferum*] at the farm was never observed to be attacked by mildew (*Peronospora arborescens*) although growing in the immediate vicinity of wild poppies (*P. rhoeas*) abundantly covered with the fungus; this observation leads the author to believe that the mildew, which is a serious parasite of the opium poppy in Jugo-Slavia [ibid., ix, p. 268], is a specialized form of *P. arborescens*.

Sclerotinia fructigena occurs every year on apples and pears, but careful removal of all infected and mummified fruits is apparently holding it in check. In some years considerable damage is done to cherry trees by *S. cinerea*, which, besides destroying a large proportion of flowers and young fruit, occasionally kills large limbs of the trees. Swedes are severely attacked by *S. sclerotiorum* in wet and badly drained fields. In 1923 *S. fuckeliana* rotted a parcel of carrots stored for the winter in damp sand. In 1923 *Isariopsis griseola* was recorded on French beans [*Phaseolus vulgaris*: ibid., viii, p. 423], causing polygonal spots on the leaves and greyish-black spots on the beans. *Fusarium falcatum* annually attacks peas and lupins; experiments in 1924 to 1926 showed that continual cultivation of these crops on the same plots considerably increased the severity of the disease.

Clithris quercina is commonly found parasitizing branches of oaks, especially those sheltered from direct sunlight; the author considers that the activity of the fungus is rather beneficial than detrimental to the trees, as it co-operates towards the natural pruning of all weakened branches.

The virus diseases briefly discussed are mosaic of French beans, [ibid., ix, p. 423], and mosaic, leaf roll, and vein necrosis of the potato.

PARK (M.). **Matters of phytopathological interest during 1929.** —*Trop. Agriculturist*, lxxiv, 4, pp. 195–199, 2 pl., 1930.

The author states that experiments in 1929 (full details of which will be published later) have conclusively shown that bunchy top of plantains in Ceylon can be transmitted by the aphid *Pentalonia nigronervosa* [*R.A.M.*, viii, p. 512]; roots of the plants used in the experiments showed neither eelworm injury nor the presence of

Rhizoctonia bataticola [*Macrophomina phaseoli*]. In wet weather plantain bunches in Ceylon are often affected by a disease caused by *Gloeosporium* (*Glomerella*) *musarum*; the disease makes its appearance soon after the setting of the fruit, and the extent of the infection depends on the prevailing environmental conditions. Infection usually occurs in the young 'finger' from the distal end, possibly starting through the flower, and results in the blackening and shrivelling of the infected 'finger'. The attack may affect the whole bunch, but is commonly restricted to one or two 'hands' only.

A mildew of the cover plant *Centrosema pubescens* recorded at Peradeniya was found to be caused by a species of *Oidium* morphologically indistinguishable from *O. heveae* [ibid., ix, p. 485]. A die-back of young graft shoots of *Hevea* rubber growing under the cover of *Dolichos hosei* [*Vigna oligosperma*] was caused by *R.* (*Corticium*) *solani*, which attacked them just above the graft patch. The same fungus was also observed attacking *Dunbaria heynei*, an indigenous legume used as a cover crop in some areas. Chillies [*Capsicum annuum*] are occasionally attacked by a serious disease caused by *Vermicularia capsici* [ibid., vii, p. 678], which usually breaks out if rainy conditions occur after the setting of the fruit. Citrus canker (*Pseudomonas citri*) is a very troublesome disease of all citrus trees at low and medium elevations in Ceylon. Satisfactory control of this disease and of mildew (*O. tingitaninum*) [ibid., viii, p. 89] is stated to have been obtained by weekly sprayings with a 3 per cent. solution of sulfinette, a proprietary lime-sulphur spray fluid [ibid., vi, p. 690].

Hopkins (J. C.). **Report of Plant Pathologist for year ending December 31st, 1929.**—*Rept. of the Secretary, Dept. of Agric., Southern Rhodesia, for the year 1929*, pp. 84–86, 1930.

During the period under review further evidence was obtained that white mould (*Erysiphe cichoracearum*) [*R.A.M.*, viii, p. 485] of tobacco is checked by heavy late rains and unusually warm nights. The wet, cloudy weather, however, delayed the ripening of the crop and favoured the development of frog eye (*Cercospora nicotianae*), which was responsible for much damage, particularly from the black spotting which occurred during curing.

The demand by growers for fungicidal dusts for seed treatment against dry rot of maize (*Diplodia zeae*) [loc. cit.] exceeded the supply, despite the importation of large consignments. Maize blight (*Helminthosporium turcicum*) in some localities completely destroyed the crops, and was present wherever maize was grown. The acclimatized varieties (Salisbury White, Hickory King, and Potchefstroom Pearl) were little affected, but others, which thrive in a dry season, succumbed.

Mosaic, aucuba mosaic, leaf roll, leaf drop streak, stipple streak, and crinkle were recorded on potato. The typical degenerated Up-to-Date potato in Rhodesia suffers from a type of 'curly dwarf', but from experimental evidence so far obtained the virus responsible for the condition appears to be closely associated with crinkle. Bean mosaic was common on both cultivated and wild species, and is thought to be the cause of the failure to ratoon Jack beans [*Canavalia ensiformis*].

In further investigations into collar rot of citrus [ibid., viii, p. 500], attention was paid to a condition apparently identical with dry root rot and usually associated with poorly drained or impervious subsoil; in some instances *Rhizoctonia bataticola* (*Macrophomina phaseoli*) was associated with the condition. This *Rhizoctonia* was distinct from that previously reported as causing a severe root disease of navel oranges, but both were found on the same estate, producing identical symptoms on the aerial parts of the trees under different conditions. Investigations into the storage of oranges under local conditions showed that the greatest losses (which were not high) were due to *Penicillium italicum* and *Oospora citri-aurantii*, but *Alternaria citri* and *Colletotrichum gloeosporioides* were also common; *P. digitatum* and *Cephalothecium roseum* were occasionally present, but caused no extensive damage.

Other important diseases reported include *Podosphaera leucotricha* on apple, *Oidium quercinum* [*Microsphaera quercina*] on oak, and *Gloeosporium papayae* on papaw.

MARTIN (G. H.). **Diseases of forest and shade trees, ornamental and miscellaneous plants in the United States in 1928.**— *Plant Disease Reporter, Supplement* 73, pp. 366–396, 2 maps, 1929. [Mimeographed. Received August, 1930.]

The following are some of the items of interest in this report, prepared on similar lines to those of previous years [*R.A.M.*, viii, p. 424]. Great silver firs (*Abies grandis*) were attacked by *Polyporus erubescens* in Idaho and by *Scleroderris bacillifera* in Oregon.

White pine blister rust (*Cronartium ribicola*) was found on *Ribes* sp. near Port Orford, Curry County, Oregon, less than 50 miles from the Oregon-California line; this marks a substantial advance in the southward spread of the disease on the coast. The rust was further found for the first time to be firmly established on western white pine (*Pinus monticola*) in four localities of Idaho.

Polyporus anceps, the causal organism of red ray rot [ibid., viii, p. 278], was found in Idaho and Washington, doing considerable damage to the heartwood of tops of living trees of *Pinus ponderosa* and developing rapidly on cull logs, tops, and stumps.

Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*] was infected by European larch canker (*Dasyscypha calycina*) on Rhode Island [ibid., viii, p. 744], and by white pocket rot (*Polyporus circinatus*) and sap rot (*P. leucospongia*) in Idaho.

Birches in Delaware were extensively defoliated by *Cylindrosporium betulae* Davies.

Chestnut (*Castanea dentata*) blight (*Endothia parasitica*) infection amounts to between 80 and 99 per cent. in parts of Tennessee, Georgia, and North and South Carolina, the incidence of mortality ranging from 1 to 50 per cent.

Gladioli suffered from mosaic, expressed by severe distortion of the flowers and abnormal coloration, in New York, New Jersey, Washington, and Montana. Irises in New Jersey, Washington, and Oregon were also affected by mosaic.

White blight of sweet peas, caused by *Erostrotheca multiformis* [ibid., viii. p. 175], caused considerable damage in New York and Pennsylvania.

Peonies in Michigan were affected by a ring spot, resembling that of tobacco [ibid., viii, p. 139], of undetermined origin.

All these records are newly submitted to the Plant Disease Survey, with the exceptions of white pine blister rust and chestnut blight, the distribution of which in the Pacific North-west and Southern Appalachians, respectively, is shown by means of maps.

Department of Botany.—*Ann. Rept. Massachusetts Agric. Exper. Stat. for the fiscal year ending Nov. 30, 1929* (*Bull.* 260), pp. 340–344, 1930.

In the section of this report dealing with tobacco diseases, W. L. Doran states that chemical acidification of the soil, especially with acetic acid, compared favourably with steam sterilization in the control of black root rot of tobacco [*Thielavia basicola*: *R.A.M.*, ix, p. 348]. Promising results were also obtained with pyroligneous acid. Practically no brown root rot [ibid., ix, p. 361] occurred on plots in continuous tobacco since 1921; the disease was present to some extent wherever tobacco followed either lucerne or timothy [*Phleum pratense*].

E. F. Guba ascertained that the conidia of the tomato leaf mould fungus [*Cladosporium fulvum*: ibid., ix, p. 349] germinate at a relative humidity of 100 per cent., which in the greenhouse is attained on the leaf surfaces when the atmospheric humidity is above 85 per cent. The provision of suitable growing conditions resulted in about 70 per cent. decrease of leaf infection and an increase of 18 per cent. in the fruit yield.

Onion blast was experimentally produced by L. H. Jones by growing the plants under conditions of reduced light and high humidity, which diminished the root growth and made the tops tender. On subsequent exposure to hot sunshine and drying wind these plants developed symptoms resembling those of blast.

In the report on the work of the Cranberry Station, H. J. Franklin states that final proof has been obtained that the false blossom disease is freely carried from diseased to healthy cranberries by the leafhopper *Euscelis striatulus* [ibid., ix, p. 324].

Forty-second Annual Report of the Nebraska Agricultural Experiment Station presented to the Governor February 1, 1929.—50 pp., 1929. [Received August, 1930.]

The following references of phytopathological interest, other than those already noticed, occur in this report. In an attempt to obtain strains of wheat resistant to bunt [*Tilletia foetens*] a number of promising Turkey Red selections have been developed. About 300 hybrid strains, some of considerable value, have been obtained from crosses of Nebraska 6 and Kanred with recognized bunt-resistant varieties.

Wilt of lucerne [*Aplanobacter insidiosum*: *R.A.M.*, viii, p. 313] is specially prevalent in the river valley counties. Infection seems to occur primarily while the spring wood is being laid down,

though a certain amount takes place later in the season. The organism spreads chiefly during the period of alternate thawing and freezing in the spring, after the plants have begun to grow. The fluctuating temperatures cause cracking and splitting of the bark at and below the collar of the plant, allowing the release of the organism from the tissues and its migration through the medium of surface water to healthy plants, which are entered through wounds in the bark. This type of winter injury has been very severe during April, resulting in a rapid increase of wilt in the fields of the Platte Valley. All attempts to isolate *A. insidiosum* from the seed of diseased and artificially inoculated plants, from the soil, and from old crowns ploughed up in the autumn and left to overwinter, have given negative results. So far, healthy plants inoculated in the greenhouse through cut stems have remained normal.

Further evidence has been obtained that the potato disease formerly considered to be a severe form of spindle tuber is identical with unmottled curly dwarf [ibid., viii, p. 357], which occurs in commercial fields and causes a total loss of infected plants. Large, misshapen, slightly cracked tubers, often with severe internal necrosis, were produced by inoculation of the top with the juice of infected plants when 6 to 8 inches high. Such tubers when planted produced typical unmottled curly dwarf plants. Unmottled curly dwarf was more easily transmitted than spindle tuber, and its juice was infective at a high dilution, thereby facilitating the separation of the two viruses. The second generation or the inoculation of seed pieces at planting time produced extremely dwarfed plants bearing no marketable potatoes. The necrotic symptoms of unmottled curly dwarf did not occur in the greenhouse. The relative effect of the environmental factors tested was found to be similar for both diseases.

Fortieth Annual Report of the New Mexico Agricultural Experiment Station, 1928–1929.—73 pp., 4 figs., 1929. [Received July, 1930.]

This report contains the following scattered references of phytopathological interest. Curly top of sugar beets [*R.A.M.*, ix, p. 425] has been observed to affect widely spaced plantings much more than dense ones.

Wilt disease [*Fusarium annuum*: ibid., vii, p. 228] of Chile pepper [*Capsicum annuum*] was found to be more prevalent among plants cultivated on the level than in those grown on ridges. A soil moisture content of about 11·5 per cent. proved to be least favourable of those tested to the development of the disease.

The Mexican June variety of maize appears to be more resistant to smut [*Ustilago zeae*] than any other sort tested.

Analyses of soil samples round apple trees affected by measles [ibid., ix, p. 222] gave the following percentages of soluble salts: 0·3929, 0·399, 0·437, 0·607, 0·497, 0·379, 0·6, and 0·56; these are considered unduly high. The addition of varying amounts of sodium chloride, sodium sulphate, calcium sulphate, and magnesium chloride, in combination and singly, to one-year-old Jonathan

apple trees planted in pots resulted in the development of measles and subsequent death of the trees, while the controls planted in soils low in soluble salts remained healthy. In the spring of 1929 about a dozen grafts made the previous year between healthy scions and measled Jonathan apples developed the disease.

Muncie (J. H.) & Patel (M. K.). **Studies upon a bacteriophage specific for Pseudomonas tumefaciens.**—*Phytopath.*, xx, 4, pp. 289–305, 1930.

This is an expanded account of the authors' studies on the potency and specificity of the lytic principle obtained from pure cultures of *Pseudomonas* [*Bacterium*] *tumefaciens*, a preliminary note on which has already appeared [*R.A.M.*, viii, p. 358].

Muncie (J. H.). **Crown gall of Rumex crispus L. and Rheum raponticum L.**—*Iowa State Coll. Journ. of Sci.*, iv, 3, pp. 315–321, 2 pl., 1930.

In June, 1926, *Pseudomonas* [*Bacterium*] *tumefaciens* was isolated from a large tumorous overgrowth on the tap root of a *Rumex crispus* plant in a Minnesota raspberry plantation, and inoculated into twelve young tomato plants with positive results. Six *Rumex* plants were then inoculated with the *Rumex* strain of the organism and nine with that from raspberry [*R.A.M.*, ix, p. 395], positive results being obtained in five plants of the former series and in seven of the latter. This is believed to be the first record of the natural infection of a weed host by *Bact. tumefaciens*. The crown gall organism was also found on three rhubarb (*Rheum raponticum*) rhizomes at an Iowa nursery in March, 1929; the plants had been dug the previous autumn from a field from which young Bolleana poplar trees [*Populus alba*] with a high percentage of infection had been removed two years earlier. *Bact. tumefaciens* was isolated from the galls and inoculated successfully into four tomato, four sugar beet, and two rhubarb plants.

Triplicate trials by the colorimetric method showed the average P_H values of the juice from *Rumex crispus* leaves to be 4·8, from healthy roots 4·2, and from the gall tissue of the root 5·9 [cf. ibid., vii, p. 78]. In the case of rhubarb, the acidity values were as follows: shoot, P_H 3·7; rhizome, 5·5; and gall tissue 5·7. The facility with which infection was induced by inoculation of the roots of *R. crispus* and of the rhizomes of *Rheum raponticum* indicates that *Bact. tumefaciens* may establish itself in a medium of relatively high acidity, and adjust the reaction of the latter to suit its own growth requirements.

Ciferri (R.). **Informe general sobre la industria Cacaotera de Santo Domingo.** [General information on the Cacao industry of Santo Domingo.]—*Estác. Agron. de Moca*, Ser. B—Botán., 16, 190 pp., 35 pl., 13 graphs, 2 maps, 1929. [Received July, 1930.]

Notes are given (pp. 94–114) on the etiology, symptoms, and control of the principal fungous and physiological diseases of cacao in the Dominican Republic, viz., root rots due to *Rosellinia pepo* and other species of *Rosellinia* [*R.A.M.*, viii, p. 20]; a root rot

apparently associated with the occurrence of endotrophic mycorrhiza; a decay of the roots in which various species of Polyporaceae and other weak parasites or saprophytes are implicated; canker (*Phytophthora faberi*) [*P. palmivora*: ibid., ix, p. 437]; *Corticium salmonicolor* [ibid., v, p. 349]; leaf spots caused by *Phyllosticta theobromae* and a local form *dominicana* [ibid., vii, p. 230]; *Physalospora theobromicola* (apparently endemic), *Septoria theobromicola*, *Leptosphaeria theobromicola* [ibid., vii, p. 230], and *Helminthosporium theobromicola* (all apparently endemic); a parasitic alga, *Cephaleuros mycoidea*; pod rot (*P. palmivora* and *Diplodia* [*Botryodiplodia*] *theobromae*) [ibid., viii, p. 70]; pod smut (*Aspergillus fumigatus*) [ibid., ix, pp. 163, 164], the perfect stage of which, *Sartorya fumigata*, is stated to have been recently produced under special conditions; the so-called 'roncet' disease, possibly due to a virus [ibid., ix, p. 511]; and various other abnormal states of non-parasitic origin.

PETIT (A.). **Contribution à l'étude de la transmission des rouilles en Tunisie.** [A contribution to the study of the transmission of rusts in Tunis.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 2, pp. 29–32, 1930.

Tests conducted in Tunis since 1922 with the susceptible soft wheat variety Bump showed that infection by *Puccinia glumarum* readily occurred in plants grown from healthy seed steeped in a 1 in 300 formalin solution, dusted with cuprous chloride, and sown in sterilized soil covered with sand. Plants grown in sterile soil mixed with large quantities of copper salts also became severely infected.

When seed steeped in copper sulphate was placed in pots containing sterilized soil and the pots were then placed under glass no rust appeared. All attempts to secure infection from spores formed the previous year (including uredo- and teleutospores of *P. graminis*) failed. It has been observed that rust always appears at certain periods of the year (February to July), wheat at other times remaining free from infection.

From these and other experiments the author concludes that soil plays no part in the transmission of *P. glumarum* to wheat in Tunis, infection being solely air-borne, and depending presumably upon the presence in the vicinity of some alternate host.

WÅLSTEDT (I.). **Bidrag till frågan om resistens mot svartrost.** [Contribution to the question of resistance to black rust.]—*Sveriges Utsädesförenings Tidskr.*, xl, 1, pp. 12–18, 1930.

Stakman's examination of samples of black rust of oats [*Puccinia graminis* f. *avenae*] from Upsala showed that the physiological form of the rust occurring in Sweden corresponds to that designated as 'highly virulent' in America [? form 4: cf. *R.A.M.*, viii, p. 69; ix, p. 518]; hence the difficulty of developing resistant varieties. Details are given in this paper of experiments on varietal reaction to the rust which have been in progress since 1916 on loam soil near Linköping. The varieties were graded 1 to 10, the latter figure denoting complete resistance.

The late, damp season of 1916 provided favourable conditions

for a black rust epidemic, which affected all the varieties tested (average grade of infection, 3–4). The white varieties, such as Seger and Guldregn, were slightly less susceptible than the black ones. Again in 1924, when heavy rain retarded sowing all over the country, there was a severe outbreak of black rust, especially on the relatively late Visingsö variety (1·8), while Kungs, Stor [Grand] Mogul, and Seger also showed considerable infection (2·7, 3, and 3, respectively). The Guldregn and Stjärn varieties proved somewhat more resistant (4·7 and 4·5), and Odal, Eko, Guldregn II, Klock II, Klock III, and Engelbrekt were intermediate (3·5 to 4). A rather late and very severe attack occurred in 1927, the Argus and Engelbrekt varieties being the most heavily infected (4·8 and 5·5, compared with an average of 6·5 to 7 for the remainder).

It is apparent from the above data that the cultivation of early varieties constitutes one of the most important measures against black rust of oats. Another valuable preventive is the application of superphosphate and potash, which accelerate maturity and promote grain and straw formation, especially on the low-lying, nitrogenous soils where the damage from the disease is most severe.

With regard to black rust of wheat [*P.g.* f. *tritici*] the problem is less complicated, since noteworthy and constant differences in reaction to the disease have been found to exist, especially among the spring varieties. In 1927 the Aurora variety was the most heavily infected (4·6 compared with 8·1 for Rubin in one test, and 5·7 as against 7·4 and 8·3 for Diamant and Rubin, respectively, in another). The Extra Kolben variety also proved highly resistant. Similar relations between the different varieties prevailed in 1929, Extra Kolben II and Rubin again showing a high degree of resistance (9·3 and 9·2 for the former in two separate tests), while Aurora was very susceptible. Among the autumn varieties Jarl appears to be highly susceptible, while Standard and Thule II are also liable to severe infection. The Sol variety seems to be generally somewhat resistant, but this character is less sharply defined than in the spring sorts. The Thule II variety was severely attacked by brown rust [*P. triticina*] in 1927.

Neatby (K. W.) & Goulden (C. H.). **The inheritance of resistance to Puccinia graminis tritici in crosses between varieties of Triticum vulgare.**—*Scient. Agric.*, x, 6, pp. 389–404, 5 figs., 1930.

The results [which are tabulated and fully discussed] of field studies conducted for three years at the Dominion Rust Research Laboratory, Winnipeg, into the inheritance of resistance in wheat to stem rust (*Puccinia graminis tritici*) [*R.A.M.*, ix, p. 94] showed that in the cross Marquis × H–44–24 field resistance is governed by a single factor, deviations from a ratio based on a single factor difference being attributed to natural crossing in the F_2 generation. This view is supported by the fact that, of 270 F_3 lines of this cross, 60 were resistant, 135 segregating, and 75 susceptible.

In the rust reactions of the F_2 generation of Marquis × Hope, dominance was less complete than in H–44–24 × Marquis, and

there were nearly three susceptible plants for each resistant one (502 and 186, respectively, with 661 semi-resistant). These figures are considered to indicate the operation of two or more factors.

The results obtained in crosses between Reward and Hope and between Reward and H–44–24 revealed a factor in Reward capable of inhibiting the action of the Hope and H–44–24 factors for resistance, and supported the conclusion that the H–44–24 resistance is governed by a single factor pair, and the Hope resistance by at least two pairs.

The figures obtained for the field reaction of 1239 F_3 lines of Marquillo × H–44–24, based on the assumption that Marquillo carries two recessive complementary factors for resistance and H–44–24 one dominant factor, gave a rather poor agreement with the calculated ratios. This disagreement is probably the result of more than two factors being concerned in the Marquillo resistance. In an F_2 generation in the same nursery, of 427 plants only 51 were susceptible, whereas on the hypothesis of a three-factor difference 98 susceptible plants would be expected. Probably, therefore, the inheritance of field resistance in this cross is governed by more than three factors.

In the F_2 generation of Double Cross × H–44–24, 689 resistant, 519 semi-resistant, and 339 susceptible plants were obtained; if two complementary recessive factors for resistance, in addition to the H–44–24 factor, were assumed to operate, 363 susceptible plants would be expected. As the agreement obtained is much closer than that reached with Marquillo × H–44–24 it is considered probable that Double Cross carries two complementary recessive factors for field resistance.

The results obtained in the F_2 generation of the cross H–44–24 × (Marquis-Kanred B_{2-5}) indicated that the field rust reaction in this cross is governed by a single pair of factors.

Two factors were found to be concerned in the cross Webster × H–44–24. Webster contributes a dominant factor for moderate susceptibility which when homozygous is epistatic to the H–44–24 factor for resistance.

Crosses between Marquillo and susceptible varieties demonstrated the complexity of the inheritance of Marquillo resistance in such cases; a very low proportion of resistant plants appeared in the F_2 generation. In the cross Marquillo × Marquis-Kanred B_{2-5} the operation of three or more factors was indicated. In Garnet × Marquillo only one plant in over 5,000 showed resistance equal to that of Marquillo; in the same year the field reaction of over 1,000 F_3 lines was determined and not one was equal to Marquillo in resistance. In Marquillo × Reward several factors also appeared to be concerned in the inheritance of Marquillo resistance; only one F_2 plant out of 1598 was as resistant as Marquillo.

In H–44–24 × Reward and in Marquis × H–44–24 awning and field rust reaction were found to be inherited independently in both crosses. Chaff pubescence was studied in relation to field rust reaction and awning in H–44–24 × Reward, and no indication of linkage was found. In Marquis × H–44–24 leaf pubescence, field rust reaction, and awning were all inherited independently.

Goulden (C. H.) & Greaney (F. J.). **The relation between stem rust infection and the yield of Wheat.**—*Scient. Agric.*, x, 6, pp. 405–410, 1 fig., 2 graphs, 1930.

When the amounts of stem rust [*Puccinia graminis*] developing in a series of plots of Marquis wheat were varied by sulphur dustings applied at different rates and intervals, the yields of the individual plots being correlated with the rust percentage, it was found that in one test each 10 per cent. of rust reduced the yield by approximately 6·8 per cent., while in another test each 10 per cent. of rust reduced the yield by 9·7 per cent. For both experiments the graph of regression of yield on percentage rust was linear, indicating that uniform increases in the amount of rust cause uniform reductions in yield.

Scheibe (A.). **Studien zum Weizenbraunrost, Puccinia triticina Erikss. II. Über die Anfälligkeit von Weizensorten gegenüber verschiedenen Braunrost-Biotypen in den einzelnen Entwicklungsstadien der Wirtspflanzen.** [Studies on the brown rust of Wheat, *Puccinia triticina* Erikss. II. On the susceptibility of Wheat varieties to various brown rust biotypes in the separate developmental stages of the host plants.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xvii, 6, pp. 549–586, 1 col. pl., 1 diag., 1930.

Continuing his studies on the occurrence of physiological forms of brown rust of wheat (*Puccinia triticina*) in Germany [*R.A.M.*, viii, p. 556], the author tested a large number of wheat varieties for their susceptibility to four such forms, viz., xi, xiii, xiv, and xv, at diverse stages of the host's development.

The results of the studies [which are fully discussed and tabulated] indicated that specialization in the individual brown rust biotypes extends over the whole period of development of the host. Both the biotypically highly resistant varieties (infection type 0) and the biotypically highly susceptible ones (infection type 4) maintain their typical mode of reaction at all stages of development. The pustule layers of the highly susceptible varieties and the necroses of the very resistant ones are more extensive on the lower leaves in the younger stages than on the upper ones of older plants. Thus in highly susceptible varieties the intensity of rust infection, i. e., the area covered with rust sori per leaf surface unit, is greater on the young leaves of young plants than on the older leaves of older plants; on the other hand, the type of rust infection characteristic of the variety undergoes no change. The varying dimensions of the rust sori or necroses on the leaves at different heights are connected with the anatomical structure of the various leaf stages.

Varieties showing a slight degree of resistance to brown rust (infection types 2 or 1) in the seedling stage acquire an increase of resistance with advancing age and on the upper leaves of the plant. This increase of resistance was found to be correlated, on the one hand, with the anatomical structure, and on the other with the intensified photosynthesis in the upper leaves. The manifestations of resistance are dependent on an optimal photosynthetic process, any reduction of which involves not only the decrease of resistance

to brown rust but a more rapid development of the teleuto stage of the fungus. Exception to these rules may be attributed to (*a*) impurity of the inoculum, (*b*) genotypically non-uniform host material, and (*c*) environmental conditions tending to obscure the symptoms, principally such factors as deficient intensity of light and low carbonic acid content of the atmosphere.

The biotypical brown rust diagnosis, made in the seedling stage, is absolutely reliable with indubitably homozygotic host plant varieties, and also gives some indication of the biotypical mode of reaction of such varieties in the later stages of development. In studies in the mode of inheritance of biotypical resistance or susceptibility to brown rust, the rust infection diagnosis should be made in the later stages of the descendants as well as in the seedling stage.

HOLTON (C. S.). **A probable explanation of recent epidemics of bunt in durum Wheats.**—*Phytopath.*, xx, 4, pp. 353–357, 1 graph, 1930.

In order to determine whether the recent severe outbreaks of bunt (*Tilletia tritici*) [*T. caries*] on durum wheats in the United States [cf. *R.A.M.*, ix, p. 445] might be due to the presence of unusually virulent strains of the fungus, five varieties of common wheat, two of durum, and one of emmer were inoculated with the spores of five collections of the organism.

Three distinct physiological forms were distinguished on the basis of pathogenicity [cf. ibid., viii, p. 767]. One, represented by the collections from Washington, California, and Manitoba is highly virulent on Kota and relatively slightly so on the other seven varieties. The collection from Devil's Lake, North Dakota, represents a form markedly virulent on the durum varieties (Mindum—C.I. 5296 and Pentad—C.I. 3822); while that from Litchfield, Minnesota, is highly pathogenic to the emmer variety (Vernal—Minn. 1524).

PETIT (A.). **Valeur de différents composés cupriques essayés au point de vue de l'action anticryptogamique vis-à-vis de la spore de la carie.** [Value of different cupric compounds tested from the standpoint of their anticryptogamic action towards the bunt spore.]—*Comptes rendus Acad. d'Agric. de France*, xvi, 14, pp. 529–533, 1930.

As a result of extensive and protracted experiments in Tunis, the writer divides the cupric compounds tested against wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] [*R.A.M.*, viii, pp. 367, 368; ix, p. 396] into the following categories.

(1) Compounds effective when used in the pure state at the rate of 250 gm. per quintal for the treatment of seed-grain containing 20 gm. of bunt spores per kg. (grade 4): cupric chloride (63 per cent. copper), arsenite (34 per cent. copper), and mono-chloracetate (injurious to germination).

(2) Compounds unsuitable for use in the pure state but efficacious against grade 4 bunt when mixed with talc: 45 per cent. cupric chloride (15 per cent. copper), 25 per cent. cupric nitrate (8·3 per

cent.), 25 per cent. cupric bromide (6·5 per cent.), and 20 per cent. fluosilicate of copper (4 per cent. copper).

(3) A compound effective in the pure state in the control of bunt in seed-grain containing 4 to 5 gm. of spores per kg. (grade 3): anhydrous copper sulphate (39 per cent. copper).

(4) Compounds effective against bunt (grade 3) when mixed with an inert powder: 30·2 per cent. cupric chloride (10 per cent. copper), 23 per cent. cupric bromide (5·9 per cent.), 23 per cent. cupric nitrate (7·7 per cent.), and 20 per cent. fluosilicate (4 per cent. copper).

(5) Compounds effective in the pure state against bunt in seed-grain containing 1 gm. of spores per kg. (grade 2): copper arseniate, oxychloride, neutral acetate, bromide, iodide, oxalate, citrate, and carbonate.

(6) Compounds effective against bunt (grade 2) when mixed with an inert powder: 15 per cent. cupric chloride (5 per cent. copper), 15 per cent. cupric nitrate (5 per cent.), 15 per cent. fluosilicate (3 per cent.), and 10 per cent. cupric bromide (2·6 per cent. copper).

(7) Compounds of insufficient or irregular efficacy against bunt (grade 2) when used in the pure state: copper sulphocyanate, sulphocyanide, sulphophenate, sulphides, oxides, phosphate, silicate, cyanide, formate, dichloracetate, borate, tartrate, phosphide, and chromate.

(8) Compounds used as mixtures which have proved ineffective against bunt (grade 2): 20 per cent. trichloracetate of copper (2·3 per cent. copper), 13 per cent. chlorate (3·2 per cent. copper), 30 per cent. monobromacetate, and 25 per cent. oleate.

It is evident from these data that the majority of the most effective salts, e. g., 40 per cent. copper chloride, are highly soluble in water and halogenated, their activity being in proportion to the atomic weight of the halogen, in a descending scale: fluosilicate, cupric bromide, cupric chloride. Below 2·6 per cent. copper, the activity of the most toxic mixtures of salts disappears when they are used as dusts, but apart from this, the fungicidal properties of the compounds bear no relation to the copper content. The compounds with a low copper content enumerated in category (5) should be widely used for the treatment of clean and slightly bunted seed-grain.

Arnaud (G.) & Gaudineau (Mlle M.). **Le traitement de la carie du Blé.** [The treatment of Wheat bunt.]—*Ann. Sci. Agron.*, xlvi, 6, pp. 742–762, 1929; xlvii, 1, pp. 1–56, 5 graphs, 1930.

This is an extended account, accompanied by 14 tables, a ten-page bibliography, and a review of the relevant early and current literature, of the authors' investigations on the treatment of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*], a summary of which has already been published [*R.A.M.*, ix, p. 234].

Tornow (Elisabeth). **Zur Prüfung von Saatbeizmitteln.** [On the testing of seed disinfectants.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, viii, 1, pp. 7–9, 1930.

In the method devised by Nagel for the testing of seed disin-

fectants against *Tilletia tritici* [*T. caries*] [*R.A.M.*, vii, p. 24], the infected seeds, after treatment, are pressed into damp, finely strained soil, gently twisted, and immediately removed, the spores becoming detached and adhering to the soil. If they germinate, the highly refractive germ-tubes show up clearly against the dark soil, especially if talc be added in the proportion of 1 : 1. In order to secure uniform results the soil should be strained as finely as possible and the moisture content kept at a suitable level—about 30 per cent. according to Vaupel (*Pflanzenbau*, ii, p. 54, 1925–6), while in the writer's tests 34 to 35 per cent. was found to be better. The use of china dishes with perforated bottoms, or unglazed clay dishes (flower-pot saucers), allows the superfluous water to drain away. They should be kept in a moist chamber for the duration of the experiment.

Jørstad (I.) & Traaen (A. E.). **Kornavsopningsforsøk med kjemikalier i årene 1925–1929 og varmtvannsavsopning av Bygg.** [Seed-grain disinfection experiments with chemicals during the years 1925 to 1929 and hot water disinfection of Barley.]—Reprinted from *Meld. Norges Landbrukshøiskole*, *1930*, 56 pp., 1930. [English summary.]

A full account, accompanied by tables, is given of the official Norwegian experiments in the control of fungous diseases of cereal seed-grain by means of chemical disinfectants during the period 1925 to 1929, inclusive [cf. *R.A.M.*, iv, p. 600]. Both liquid and dry preparations were used against wheat bunt (*Tilletia caries* and *T. levis* [*T. foetens*]), covered smut of barley (*Ustilago hordei*), loose and covered smuts of oats (*U. avenae* and *U. levis* [*U. kolleri*]), and barley stripe (*Helminthosporium gramineum*).

The smutted and treated seed-grain was sown, usually at the rate of 200 gm. at each of two replications, on plots of 10 sq. m., in two different localities, viz., Vidarshov near Hamar [central Norway] and Ås near Oslo. The stripe-diseased barley was sown at Voll near Trondhjem.

Good control of wheat bunt was given by steeping in solutions of formalin (0·33 per cent., 20 minutes), germisan (0·125 per cent., 30 minutes), uspulun-universal (0·25 per cent., 30 minutes), or weizenfusariol (0·3 per cent., 30 minutes). Adequate results were further obtained by 30 minutes' immersion in agfa-saatbeize (0·25 per cent.) or uspulun (0·5 per cent.), and by one hour in urania-saatbeize (0·25 per cent.), as well as by sprinkling with 0·3 per cent. germisan or 0·45 per cent. weizenfusariol, and dusting with tillantin (200 gm. per 100 kg. of seed-grain), urania tr. 131 (300 gm.), or tutan (200 gm.). Sprinkling with uspulun-universal and urania-saatbeize (0·5 per cent.) proved unsatisfactory.

Covered smut of barley occurred only in a mild form and was well controlled by steeping in agfa-saatbeize (0·25 per cent., 30 minutes), formalin (0·33 per cent., 20 minutes), germisan (0·125 per cent., 30 minutes), uspulun (0·5 per cent., one hour), uspulun-universal (0·25 per cent., 30 minutes), or weizenfusariol (0·3 per cent., 30 minutes), the efficacy of the preparations being in the order named. Sprinkling with formalin or germisan gave good control, as did also spraying with 50 per cent. commercial formalin

(Haskell's method, *Phytopath.*, vii, p. 381, 1917). Dusting with abavit B (200 gm.), agfa tr. 33 (350 gm.), tutan (150 to 250 gm.), or urania tr. 131 (300 gm.) was also effective, especially with the first-named.

The smuts of oats were completely controlled by steeping in solutions of formalin (0·33 per cent., 20 minutes) or havrefusariol [quantity not specified, 30 minutes], and by spraying with 50 per cent. or sprinkling with 0·5 per cent. commercial formalin. Dusting with abavit B (500 gm.) or tutan (400 gm.) was moderately effective, and so was 30 minutes' immersion in 0·25 per cent. germisan.

Good control of stripe disease of barley was given by 30 minutes' immersion in 0·25 per cent. germisan, while sprinkling with the same preparation (0·5 per cent.) was also fairly efficacious.

The short disinfection process [*R.A.M.*, ix, p. 168] proved useless against the oat smuts and barley stripe, but gave some indication of a possible value in the control of wheat bunt. Generally speaking, dusting was reliable against wheat bunt and covered smut of barley, less so in the control of the oat smuts, and useless against barley stripe. All the dusts caused some reduction of germination of oats and barley. Copper carbonate proved inadequate for the control of any of the diseases mentioned. All the formalin treatments caused a certain amount of seed injury, which was minimized, however, by washing the seed-grain in water shortly after treatment. Steeping in weizenfusariol delayed the germination of wheat and impaired that of barley and oats, the last-named suffering also from immersion in germisan and havrefusariol.

KERLEROUX (L.). **Quelques observations sur le piétin du Blé.** [Some observations on foot rot of Wheat.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 2, pp. 36–40, 1930.

On Bon Fermier wheat affected by foot rot the author noted eye spot lesions of the type usually attributed to *Leptosphaeria herpotrichoides* but associated with an undetermined fungus whose cultural characters were quite different. A few lesions were observed on 15th March, and by 11th May infection had become intense; a fortnight later, 45 per cent. of the plants were affected. On the culms of the previous crop, which had overwintered in the field, a very few perithecia of *L. herpotrichoides*, numerous perithecia of *Ophiobolus herpotrichus*, and the pycnidia of *Wojnowicia graminis* were present [*R.A.M.*, ix, p. 236]. The attack caused by the undetermined fungus followed a hard winter, and is attributed to spring infection, but that autumn infections also occur was demonstrated by the fact that when wheat was sown on 15th September in artificially infected soil, eye spot lesions were observed on 7th November, others also being noted on 18th November and 16th January on wheat similarly sown on 1st and 15th October, respectively.

When wheat plants infected with eye spot only in the sheath were transplanted into pots, and the sheath was separated from the stem so that contact existed only at one point 2 or 3 cm. below the lesion, infection was transmitted to the stem only at this point.

In other cases removal of the sheath sometimes was followed by culm infection on a level with the sheath lesion, and sometimes arrested further attack.

In spite of the large percentage of affected shoots very few collapsed, the lesions drying up with the onset of hot weather; there were, however, 10 to 15 per cent. deaf ears, these plants showing the unidentified eye spot fungus near the base of the stem.

Foëx (E.) & Rosella (E.). **Sur les diverses formes du piétin.** [On the different forms of foot rot.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 2, pp. 41-51, 1930.

An examination of the eye spot lesions caused by the undetermined fungus associated with the collapse of foot-rotted wheat [see preceding abstract] showed the presence of faintly coloured, cylindrical, often flexuose, septate hyphae of varying diameter. Characteristic mycelial wefts were seen, some of which were compact and well defined, and largely composed of polygonal, oval, or rounded cells with thin or thick membranes, the latter type being characteristic. Appressoria were present. The hyphae penetrated through the epidermis into the mesophyll of the sheaths, and even into the vessels. In cultures on liquid and agar media the fungus formed round, protuberant, almost tuber-like, often velvety, light or dark ashy-grey masses. In old cultures highly characteristic jet-black mycelial strands appeared in contact with the glass. Artificial inoculations of wheat grown aseptically or in the field gave positive results. When wheat was grown in infected soil the severity of the attack was directly proportional to the earliness of the sowing. The fungus can cause either the collapse of the plants or the whiteheads type of foot rot, according to the site and time of attack.

A few perithecia of *Ophiobolus graminis* were seen from 6th July onwards on plants bearing whiteheads, and the fungus was isolated from the brown lesions characteristic of attack by this species, the morphology and method of penetration of which are briefly described.

Numerous perithecia of *O. herpotrichus* were found, especially towards the end of March, on culms overwintered in the field. They were localized at the lower internode, particularly on a level with the point of insertion of the sheaths. The ascospores usually germinated within the asci. From these, pure cultures were obtained which on agar were greyish-white with a rather dark blue, striated appearance, the grey being due to a cottony mycelium and the striae composed of hyphae in bundles; cultures in Petri dishes showed alternate light and dark zones. Appressoria were present and the hyphae terminated in swellings. Inoculations of aseptically grown seedlings gave positive results, the penetration of the mycelium producing violent reactions in the epidermal cells of the host, the wall of which formed roughened protuberances. The tissues of the sheath and stem were invaded by a pale mycelium. Inoculations of plants in pots gave weakly positive results.

The pycnidia of *Wojnowicia graminis* were commonly present

on culms overwintered in the field, usually at the second node. In one field the authors on two occasions noted circular, superficial spots at the internode, from which *W. graminis* was isolated. Artificial infections of aseptically grown seedlings gave positive results, a mycelium with numerous large appressoria appearing on the epidermis ; inoculations of seedlings in pots were also successful, well-developed papillae being produced in the epidermal cells and resisting the progress of the mycelium, which failed to pass beneath the subepidermal layer.

Early in 1929 on eye spot lesions on wheat the authors observed the conidia of *Cercosporella herpotrichoides* Fron, these being also noted on wheat sown on 15th September in artificially infected soil. Transfers effected in the field gave eye spot lesions from which the conidia were obtained in hanging drop cultures. The conidiophores were short, occasionally cylindrical, generally swollen at the base and elongated at the tip ; some were constricted a little below the extremity, which was then slightly swollen. The conidia were generally formed in pairs, but sometimes singly. Germination occurred with the emission of hyphae or, more often, by the formation of secondary conidia. It is still uncertain whether the undetermined eye spot fungus belongs to this species or not.

O. graminis acidified the medium during the first 20 days' growth, after which alkalinity set in ; the remaining fungi discussed above all caused the medium to become alkaline during growth. Only the undetermined eye spot fungus and *O. graminis* are considered to be actively parasitic.

Guyot (A. L.). **De l'influence de quelques opérations culturales sur le développement du piétin du Blé en 1928–1929.** [On the influence of certain cultural practices on the development of foot rot of Wheat in 1928–1929.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 2, pp. 52–62, 1930.

A full account is given of tests conducted in northern France to ascertain the effect of various cultural operations upon the development of foot rot of wheat [*Leptosphaeria herpotrichoides, Ophiobolus herpotrichus, Wojnowicia graminis*, and an undetermined fungus : see preceding abstracts] in a field of the dwarf Prolific variety mostly sown on 3rd November, 1928. The field was infected from previous crops, but owing to the weather relatively little foot rot occurred. The results of all the tests are tabulated and discussed in detail.

Four types of complete manurial dressings were applied, namely, (*a*) an autumn application of 150 kg. each of potassium nitrate and ammonium phosphate, made at the end of October, 1928 ; (*b*) the same, applied on 5th March, 1929 ; (*c*) 150 kg. potassium nitrate applied in autumn and followed by 195 kg. sodium nitrate in the spring : and (*d*) 150 kg. ammonium phosphate in autumn followed by 135 kg. sodium nitrate in spring.

Dressings (*b*) and (*d*) had very little direct effect on the yield, dressing (*c*) increased it by 27·6 per cent., and dressing (*a*) by 62·8 per cent. All the dressings, however, also increased the percentage of stems attacked, (*a*) slightly, but the others more than doubling

the amount of disease; only dressing (*a*) gave an increased yield which more than counterbalanced the increased infection, and it is considered that even if the foot rot had run its normal course, this dressing would have led to a net increase in yield of over 40 per cent. Autumn-spring dressings are held to involve more risk than those given in either season alone.

Light, medium, and heavy autumn-spring applications consisting, respectively, of 40 and 110 kg., 80 and 170 kg., and 120 and 230 kg. sodium nitrate were also made, the lesser quantity in each case being given on 30th November, 1928, and the larger on 5th and 6th February, 1929. Only the heaviest application increased the yield, which it raised by 23 per cent. All the dressings increased the percentage of stems attacked, the light and medium applications doubling and trebling it, respectively. Had the disease developed in the usual way none of the dressings would have increased the yield sufficiently to compensate for the increased infection.

Spring dressings of sodium nitrate applied at the rates of 150, 250, and 350 kg. gave, respectively, increased yields of 7·6, 25·3, and 31·8 per cent. The heaviest application had varying effects on the amount of infection, but the smallest and medium rates increased it by 205 and 42·4 per cent., respectively. As regards both effect on yield and effect on the amount of foot rot which develops, one spring nitrogenous dressing is preferable to one in spring and another in autumn, especially if the amount of sodium nitrate given in the one application is at least 250 kg.

Applications of sulphuric acid (12 l. water and 1·5 l. acid at 65° B.) at the rate of 12 l. per are were made on 18th March, 23rd April, and 16th May, 1929. The first and last applications reduced the yield by 25·9 and 32·4 per cent., respectively, but that given on 23rd April increased it by 28·2 per cent. All the applications reduced the percentage of affected stems, whatever the type of foot rot; this effect was most marked with the later ones, the final application almost completely suppressing the lesions. The date of sowing appeared to have no effect on the treatment.

Cutting with a scythe, or by mechanical means, or allowing sheep to graze the field, which was done on 24th May, all adversely affected yield, the first-named practice also increasing the number of affected stems by 44·6 per cent.

Lindegg (Giovanna). **La golpe bianca del culmo di Grano.** [White blight of the culm of Wheat.]—*Riv. Pat. Veg.*, xx, 3–4, pp. 79–85, 4 figs., 1930.

The author describes an attack of white blight on Mentana wheat, caused by *Fusarium roseum* Link (the conidial stage of *Gibberella saubinetii*) [*R.A.M.*, viii, pp. 264, 432], but affecting only the upper internodes nearest the ears; the ears themselves were dried up, twisted, and empty, but showed no fungal invasion, and the lower part of the culm and the roots remained healthy. In some plants the sheath and leaf blade corresponding to the infected part of the culm were attacked. The diseased portions of the culms emitted a mouldy odour and were in turn whitish, reddish, yellow, and finally black, when they became very brittle.

When diseased material was placed in a damp chamber a reddish-

white mycelium formed, consisting of branched, septate, granulose hyphae bearing falcate, reddish, 3- to 5-septate conidia measuring 48 to 50 by 4 to 6 μ. Sclerotia were also observed in process of formation.

HÜLSENBERG (H.). **Betrachtung zum Auftreten des Meltaus (Erysiphe graminis DC) bei Winterweizen und Sommergerste im Jahre 1929 in der Provinz Sachsen.** [Observations on the occurrence of mildew (*Erysiphe graminis* DC) on winter Wheat and summer Barley in the year 1929 in the province of Saxony.]—*Forschr. der Landw.*, v, 7, pp. 233–235, 1930.

The reaction of 19 winter wheat and 13 summer barley varieties to mildew (*Erysiphe graminis*) [*R.A.M.*, viii, p. 433], which occurred in a very severe form in Saxony during 1929, is discussed and shown in tabular form. The most resistant wheat was Ella, followed by Salzmünder Standard, and the most susceptible Strube's Gen. von Stocken. None of the barleys showed a conspicuous degree of resistance to the fungus; Ackermann's Bavaria was the least affected and Bethge III the most.

MAINS (E. B.) & DIETZ (S. M.). **Physiologic forms of Barley mildew, Erysiphe graminis hordei.**—*Phytopath.*, xx, 3, pp. 229–239, 3 figs., 1930.

This is an expanded account of the writers' investigations on physiological specialization in the barley mildew fungus, *Erysiphe graminis* [var.] *hordei*, a preliminary note on which has already been published [*R.A.M.*, ix, p. 370]. Of the forty varieties of barley used in the studies (which were pursued from 1923 to 1928 at Purdue University, Indiana, and from 1926 to 1928 at the Iowa Agricultural Experiment Station), three (Arlington 702, Duplex 2433, and C. I. 2444) were found to be highly resistant to all five physiological forms of the mildew, while Oderbrucker 940, Odessa 102, Bohemia 204, and Hooded Spring 716 were susceptible to all. Sixteen varieties, including several strains of Chilean and Abyssinian, were more or less resistant to all the forms; Goldfoil 928, Hanna 906, Consul 1061, C. I. 1080, and C. I. 2416 were susceptible only to form V. Eight varieties, including Peruvian 935, Blackhull 878, and Hanna 966 proved more or less susceptible to forms III and V and resistant to the others; Black Hull-less 666 was found to be more or less resistant to forms I and II and Oswong 697 to I and IV. Five varieties, viz., Purple Nepal 1373, Black Hull-less 1032, Nepal 595, Nepal 475, and Heil's Hanna 682 were resistant only to form I.

STRIULCIUC. **Atypische Korrodierung der Stärke bei der mit Fusarium roseum und Gibberella saubinetii befallenen amerikanischen Futtergerste.** [Atypical corrosion of starch in the American fodder Barley infected by *Fusarium roseum* and *Gibberella saubinetii*.]—*Zeitschr. für Untersuch. der Lebensmittel*, lix, 2–3, pp. 258–265, 15 figs., 1930.

During the autumn of 1928 the writer examined, at the Animal Breeding Institute of the Berlin Veterinary College, a number of barley samples infected by *Gibberella saubinetii* (in the conidial

stage, *Fusarium roseum*) which were either rejected by pigs or produced adverse effects in these animals [*R.A.M.*, ix, p. 369]. The starch grains in the diseased barley presented an aspect of atypical corrosion, characterized by a shot hole appearance of the surface and jagged, 'gnawed' edges—due in both cases to loss of substance through local fermentation. This type of corrosion is quite distinct from that observed in the starch of germinating seed-grain or in samples showing heavy fungous infection, and may be used (since it is consistently associated with the disease) as a diagnostic feature of the presence of *G. saubinetii* in the groats and flour.

Müller (K. A.). **Über das Auftreten der Typhulafäule an Wintergerste und -Roggen in der Provinz Sachsen.** [On the occurrence of the *Typhula* rot of winter Barley and Rye in the province of Saxony.]—*Deutsche Landw. Presse*, lvii, 17, p. 234, 1 fig., 1930.

For some years past sporadic occurrences of *Typhula graminum* on winter barley have been reported in the Halle and Delitzsch districts of Saxony; this year specimens of diseased barley and rye have been received from various parts of the province [*R.A.M.*, vi, p. 146; viii, p. 288; ix, p. 29]. Affected plants are characterized by a vivid brownish-yellow discoloration of the outer leaves, which subsequently spreads to the inner ones; ultimately the entire plant shrivels and often dies. The reddish-brown, depressed-spherical, occasionally elongated sclerotia, the size of a millet grain, may be observed on the lower shoots and frequently also on the upper parts of the main roots; they drop from the plant and overwinter in the soil, producing in the spring fructifications which cause fresh infections. Most of the diseased plants were found to be simultaneously invaded by stem eelworms, which may have weakened their resistence to the attacks of the fungus. Crop rotation is essential to the control of the disease.

Ficke (C. H.) & Johnston (C. O.). **Cultural characteristics of physiologic forms of Sphacelotheca sorghi.**—*Phytopath.*, xx, 3, pp. 241–249, 2 figs., 1930.

The three recently discovered physiological forms of covered kernel smut of sorghum (*Sphacelotheca sorghi*), a preliminary note on which has already been published [*R.A.M.*, ix, p. 375], were shown to be distinct in culture on various agar media, differing in colour, surface, consistency, margin, and growth rate.

On carrot agar form I (attacking Pink Kafir but not milo or feterita) is characterized by an ivory-yellow colour and bacterioid consistency in young cultures, later becoming felted, with a tufted centre. Form II (attacking milo moderately and Pink Kafir severely, while feterita is immune) ranges from cinnamon- to cream-buff, turning umber-coloured with age; young cultures are beaded and older ones densely reticulate. Form III (attacking feterita and Pink Kafir but not milo) may be distinguished by its olive-buff colour and sparse spiny projections, which subsequently disappear. On potato-dextrose agar the characters of the various forms are similar to the foregoing. On oatmeal agar form I is

cartridge-buff in the centre, the remainder being covered with a white felt; form II is umber to russet in the centre and white elsewhere; and form III is olive-buff with spots of russet and a white margin. The growth rate of all three forms is about equal on oatmeal agar, but on carrot and potato-dextrose agar form II grows more rapidly than either of the others.

The occurrence of wedge- or fan-shaped sectors was observed fairly often in cultures of form I arising from smut spore cultures, but not in monosporidial cultures. The other forms were apparently very stable, sectors appearing only once in form II and not at all in III.

Fawcett (H. S.). **Citrus diseases in Palestine.**—Reprinted from *Hadar*, iii, 4, 8 pp., 1930.

In this lecture, delivered before a meeting of agriculturists and citrus growers at Tel Aviv, some observations are made on the more important diseases of citrus occurring in Palestine. Only two active cases of brown rot gummosis were detected by the speaker in the course of his travels, thanks to the efficiency with which the Californian methods of prevention and treatment have been carried out. Dr. Reichert's isolation and inoculation experiments have shown that the causal organism of this disease [*Phytophthora citrophthora*: *R.A.M.*, ix, pp. 302, 303] is similar to that responsible for the same condition in California.

'Mal secco' [see next abstract], characterized by a reddish staining of the branches, was observed in two orchards on lemon and sour orange [*Citrus aurantium* or *bigardia*] trees.

'Little leaf' [ibid., viii, p. 235], which does not occur in California, appears to be the most important foliage disease seen.

Savastano (G.) & Fawcett (H. S.). **Ricerche sperimentali sul decorso patologico del mal secco nel Limone.** [Experimental researches on the pathological development of 'mal secco' in the Lemon.]—Reprinted from *Ann. R. Staz. Sperim. Agrumic. e Fruttic. in Acireale*, xi, 37 pp., 6 pl., 1 fig., 1930.

In this detailed account of the authors' investigations into the 'mal secco' disease of citrus (*Deuterophoma tracheiphila*) [*R.A.M.*, ix, p. 522] in Sicily it is stated that when affected branches are shaken many of the fruits and leaves drop although still green, the vascular bundles showing a brown discoloration. The leaves become detached at the suture between the stalk and the blade. Fruits and leaves showed the presence of *D. tracheiphila*, which was found to extend about half-way along the fruit vessels and the midrib of the leaf. No evidence was obtained that penetration occurs, in the first place, through the leaves. The fungus was constantly isolated from the orange coloured tissues of the branches, trunk, and (occasionally) the roots, the faintest trace of orange discoloration being certain evidence of its presence.

Isolations from the twigs of affected lemons also gave *Fusarium* sp., *Phomopsis* sp., *Phytomonas* [*Pseudomonas*] *citriputeale*, and *Colletotrichum gloeosporioides*; the last-named has already been shown not to be the causal organism of 'mal secco' [loc. cit.], and inoculations [which are described] with the *Fusarium* and

Phomopsis sp., clearly demonstrated that they cause only slight local lesions.

Numerous 4-year-old lemons grafted on sour orange [*Citrus bigaradia*] and also ungrafted sour oranges were inoculated at the top with pure cultures of *D. tracheiphila*, others being similarly wounded, but not inoculated. About two months later, the apical leaves of the inoculated trees began to fall and sections of the twigs showed slight discoloration. Five months after the inoculations the parts above the point of inoculation had withered, while the fungus was reisolated from discoloured parts of the trunk 25 to 70 cm. below. All the uninoculated controls remained healthy.

When green fruits on 14-year-old lemons were inoculated by inserting diseased tissue they developed a yellowish discoloration round the point of inoculation and the older fruits dropped. In fruit inoculations with cultures of the organism, lateral inoculations gave slower results than those in the fibrovascular bundle under the peduncle. Inoculations of twigs by grafting gave positive results only occasionally. The inoculation of a 6- to 7-year-old branch with a pure culture of the fungus caused about one-third of the leaves to drop and produced typical discoloration. *D. tracheiphila* was reisolated at 1·57 m. above the inoculation point, but not farther than 34 cm. below. In other inoculations the rate of ascent of the fungus was four or five times the rate of descent, for the same period.

Inoculations of the trunk at various distances from the ground showed that in five months *D. tracheiphila* travelled, on an average, 3·31 m. above the inoculation point, but only 10 cm. below it. Inoculations nearest the ground caused the severest and most extensive infection, estimated by the amount and intensity of the discoloration.

When pieces of tissue affected with 'mal secco' were inserted into lemon roots violent infection rapidly took place, *D. tracheiphila* being subsequently found 3·65 m. above the inoculation point but not advancing more than 25 to 30 mm. towards the root tips. Root inoculations with pure cultures of the fungus produced a similar result, *D. tracheiphila* being found 3·57 m. above, and not more than 4 cm. below, the point of inoculation. All the controls remained healthy throughout the experiments.

The authors consider that root infection is a decided possibility in this disease, and that the severest cases result from this source. If only one root is affected by *D. tracheiphila*, the symptoms appear only on the corresponding side of the tree, but occasionally lateral extension occurs, apparently at the root level, and the symptoms become more generalized. Usually the area of discoloration in the trunk does not widen unless more than one root is affected. The orange colour denoting the presence of the mycelium becomes more intense towards the top of the tree.

Toxopeus (H. J.). **De gomziekte in Djeroek manis (Citrus sinensis Osbeck) en hare bestrijding.** [Gumnosis of Djeroek manis (*Citrus sinensis* Osbeck) and its control.]—*Korte Meded. Inst. voor Plantenziekten*, 13, 6 pp., 4 figs., 1930. [English summary.]

Heavy damage may be caused to sweet oranges (*Citrus sinensis*)

in Java by the attacks of *Phytophthora parasitica* [*R.A.M.*, ix, pp. 302, 325], an annual loss of 2 to 3 per cent. of eight- to nine-year-old trees being not uncommon, while cases of even more extensive injury are on record.

The first symptoms of the disease are the exudation of a pale brown gum, and a damp black discoloration of the cortex. The dead cortex flakes off, giving entry to all manner of secondary parasites and frequently involving reinfection by *P. parasitica*; very large wounds develop in this way. The leaves turn yellow, forced blooming often occurs, and after a short time the tree dies.

The zoospores of the fungus are probably conveyed from diseased to healthy trees by rain and irrigation water, so that one important preventive measure is to keep the base of the stem as dry as possible. This may be effected by irrigation in furrows round the trees, which should be planted on slight elevations with the crown roots just above soil level, and by keeping the plantations well drained. Care should further be taken not to wound the trees during cultivation operations. Monthly inspections should be made to check the development of large lesions: the bark should be excised for at least 1 cm. round the diseased tissue and covered with raw paraffin mixed with 4 to 8 per cent. carbolineum plantarium, which arrests the spread of infection without damaging the living cambium. Within two months the wound heals by the formation of a thick layer of callus tissue. Treatment with Bordeaux paste and other preparations was effective in checking the progress of the disease but destroyed the cambium and prevented callus formation.

JENKINS (ANNA E.). **Insects as possible carriers of the Citrus-scab fungus.**—*Phytopath.*, xx, 4, pp. 345–351, 2 figs., 1930.

On young leaves of the sour orange (*Citrus aurantium*) from Florida, the writer found a small mycetaeid beetle feeding on the scab fungus (*Sphaceloma fawcettii*). Examination of the stomach contents revealed many hundreds of the conidia and conidiophores of *S. fawcettii*, which had apparently undergone little or no change. Lesions of citrus scab were also observed on other leaves from which the fungal growth had been eaten away by various insects, from the faeces of which *S. citri* and *Cladosporium* sp. were isolated.

KLOTZ (L. J.). **Some microscopical studies on Penicillium decay of Citrus.**—*Phytopath.*, xx, 3, pp. 251–256, 2 figs., 1930.

In connexion with his studies on the decay of citrus by *Penicillium digitatum* and *P. italicum*, a preliminary notice of which has already appeared [*R.A.M.*, ix, p. 304], the author compared the rotting caused by the living fungus with the softening produced by the injection of solutions of oxalic acid, ammonia, and an extract of the fungi into the albedo of the fruit [cf. ibid., ix, p. 106].

Injections of 1 per cent. oxalic acid were found to cause a maceration of grapefruit and orange rind, the latter remaining firmer and more turgid than the former. The portion of the rind

affected by the acid was uniformly depressed, making a smooth, fairly firm area. The effect produced by the extract of the dried fungus differed from that of the chemical in being softer, less uniformly sunken, and of a faintly brown colour. Furthermore, the extract, unlike that of *P. oxalicum*, gave no qualitative test for the oxalate ion [ibid., viii, p. 377]. Neither distilled water nor a 1 per cent. solution of ammonia produced a noticeable effect on orange or grapefruit in 18 hours, but after 48 hours the orange injected with ammonia showed a slight browning and a shallow, irregular sinking, while the grapefruit remained unaffected. However, the rind of fruit injected with a 5 per cent. solution of ammonia acquired, within five hours, a sayal-brown to cinnamon-coloured (Ridgway) area, which was much firmer and considerably darker than that caused by the fungus extract. It is considered possible that the ammonia liberated by the desaminases and desamidases of *P. digitatum* and *P. italicum* may be partly responsible for the decay.

Gioelli (F.). **Sopra un caso di cascola dei frutti di Mandarino.** [On a case of fruit-drop of Mandarin.]—*Riv. Pat. Veg.*, xx, 3–4, pp. 73–77, 2 figs., 1930.

An examination of pale, undersized mandarin oranges on trees in thickly planted orchards near Palermo affected with premature fruit dropping showed the presence on some of them of a brown spot near the insertion of the stalk; all the fallen fruit showed the same lesion, which on these gradually affected the whole rind, a typical *Penicillium* mould marking the final stages of the condition. Cultures made from material taken near the spot and also from apparently unaffected parts of the rind, fruit still on the tree being used, invariably gave *P. digitatum*. Inoculations of healthy mandarins made by injecting an aqueous solution of the spores, by slight wounding, or by spraying the spores on to the part left open when the stalk was removed all gave positive results, although uninoculated fruits kept under similar environmental conditions remained unaffected.

The author considers that the fungus, aided by the unsuitable conditions of humidity and light in which the trees were growing, developed at the point of insertion of the stalk, invaded the tissues of the rind and thus caused the fruit to become flaccid and drop.

Sharples (A.) & Jorgensen (L. P.). **A serious stem-rot of Oil Palms (Elaeis guineensis).**—*Malayan Agric. Journ.*, xviii, 4, pp. 184–187, 1930.

This is a preliminary account of a serious stem disease of the oil palm (*Elaeis guineensis*), which is said to have been steadily gaining ground since 1928 in Malaya, where as much as 10 per cent. of the trees in some plantations are attacked. It is usually found in palms 8 to 10 years old, but in one recent case it was recorded on a 5-year-old tree. In the majority of cases the rot appears to start in the short length of leaf base left adhering to the trunk after pruning, whence the decay extends into the trunk and then progresses rapidly in a transverse direction; vertically, however, the rot does

not advance more than two to three feet, and the lower part of the trunk (from ground level up to three to five feet) is usually quite sound. The attacked leaf bases and fibrous tissues of the trunk are of a reddish-brown colour, and in advanced cases the diseased tissues become spongy and wet. In some cases no signs of decay are apparent externally, and these palms retain their green leaves and generally healthy appearance even when only a small portion of the trunk remains unaffected. Outwardly the disease is very similar to the stem rot of oil palms which occurs in West Africa and is attributed to *Ganoderma applanatum* [*R.A.M.*, ix, p. 305].

Isolations from diseased tissues have yielded pure cultures of *Fomes lamaoensis*, *G. applanatum*, and an unidentified fungus, and fructifications which have been recently gathered from a previously treated diseased stem were identified as a sessile, hardly laccate form of *G. lucidum*. Inoculation experiments with the above-named organisms are in progress.

The preventive and control measures recommended are the excision of all apparent lesions as soon as detected, the protection of all wounds first with a coating of a 20 per cent. solution of agrisol [ibid., v, p. 184] and a day or two later with a coating of coal-tar, and the removal of all the prunings from the oil palm plantations.

Fawcett (H. S.). **An offshoot and leafstalk disease of Date palms due to Diplodia.**—*Phytopath.*, xx, 4, pp. 339–344, 2 figs., 1930.

Date palms (*Phoenix dactylifera*), chiefly of the Deglet Noor variety, in the Coachella Valley of California have recently been suffering from a disease of the offshoots and petioles caused by a species of *Diplodia* resembling *D. natalensis* [*R.A.M.*, viii, p. 550]. In severe cases the offshoots are killed either while still attached to the mother palm or after separation and planting out, while the leaves of older palms may die prematurely as a result of infection. In offshoots the disease is shown in two distinct ways: in one form the outside leaves die first and the younger shoots and bud remain alive for some time; in the other, the dying-back of the centre of the offshoot or bud precedes the death of the older leaves. Infection appears to occur either at the base of the offshoot, near its juncture with the mother palm, or in the outside leaves of the offshoot, spreading later to the newer leaves and heart. In the leaves of older palms the ventral midportion of the stalks is the part usually affected, showing yellowish-brown streaks extending upwards 6 inches to 3 or 4 ft. from the base. On green leaves the streaks may be 3 to 4 inches wide at the base, narrowing rapidly upwards to half an inch or less. In a large leaf these brown streaks have been observed to extend as much as 4½ ft. from the base and another 2½ ft. beyond this point as a yellow streak.

The *Diplodia* was isolated from diseased tissues, inoculated into healthy palms with positive results [which are briefly described], and ultimately reisolated from the artificially induced lesions. Pruning wounds and defective irrigation are factors predisposing the palms to infection, while a number of secondary organisms, e. g., *Penicillium roseum*, *Aspergillus niger*, *Fusarium* spp., and *Rhizopus* spp., may accentuate the symptoms.

The spores of the fungus are at first unicellular and hyaline like those of *Macrophoma*, but later, under certain conditions, they become dark and bicellular, measuring 22 to 24 by 10 to 12 μ; pycnidia have not been found on living material, but are common on dead leaf parts at certain times, and are also formed on inner protected dead leaves of dying offshoots and in infected tissues in a moist chamber.

All pruning tools and cut surfaces should be disinfected, e. g., with a 2 per cent. solution of formalin. The palms should be sprayed with an ammoniacal solution of copper carbonate consisting of 5 oz. copper carbonate and 3 pints ammonia (26° Beaumé) to 50 galls. water.

MARTYN (E. B.). **The Sclerotium disease of Coffee. Some notes on the origin of the disease, its outbreak, and control.**—*Agric. Journ. Brit. Guiana*, iii, 1, pp. 28–34, 1930.

In September, 1929, the white bristles of *Sclerotium coffeicolum* [*R.A.M.*, viii, p. 565] were found on various common weeds in the coffee plantations in the North-West District of British Guiana, including *Commelina nudiflora* and *Vitis sicyoides*, while they were also noted on the lower leaves of *Gardenia* (?) *jasminoides* near unaffected Liberian coffee. In October, they were further found on an unidentified shrub far removed from any coffee, the sclerotia also being present on dead leaves in the forest.

Inoculations of Liberian coffee seedlings with mycelium of the fungus taken from coffee and dead leaves in the forest gave negative results, no penetration taking place under damp conditions even when the leaves were pricked. Wounded Liberian coffee berries a week to ten days after inoculation in damp chambers with material from either source turned brown over part of their surface, which was covered with the mycelium of *S. coffeicolum*. Aerial rhizomorphs arose, which lacked the rigidity and uniformity of the true bristles and in a drier atmosphere shrivelled up, no bristles being formed. When the berries were kept in a damp atmosphere sclerotia developed about a fortnight after inoculation.

It is concluded that the fungus found on dead leaves in the forest was *S. coffeicolum*, which appears to be a common saprophyte that under favourable conditions gains a foothold on the leaves of living plants, the essential factor in favouring dispersal being the formation of bristles.

Optimum conditions for infection arise, apparently, only when a dry period follows a long wet season, a certain minimum humidity, however, being necessary for the development of the fungus.

Brief notes are given on control [loc. cit.] and on the cost of spraying with Bordeaux mixture.

MULLER (H. R. A.). **De verschijnselen van topsterfte en insterving sziekte bij Koffie.** [The symptoms of top disease and die-back of Coffee.]—*Korte Meded. Inst. voor Plantenziekten*, 12, 5 pp., 4 figs., 1930. [English summary.]

Most of the information presented in this paper on top disease and die-back of coffee in the Dutch East Indies [associated with a

species of *Rhizoctonia*] has already been noticed from another source [*R.A.M.*, ix, p. 305], but the following statement regarding varietal susceptibility is of interest. Both diseases have been found affecting *Coffea robusta*, *C. canephora*, *C. quillou*, *C. uganda*, *C. excelsa*, *C. dybowski*, *C. liberica*, and *C. abeocuta*, while top disease also attacks *C. arabica* and its variety *margogype*, which do not appear to be liable to die-back.

GOLDING (F. D.). **A vector of leaf curl of Cotton in Southern Nigeria.**—*Empire Cotton Growing Review*, vii, 2, pp. 120–126, 1930.

Results of experiments with *Gossypium peruvianum* in insect-proof cages at Ibadan, South Nigeria, in 1927 and 1929 [details of which are given], indicated that leaf curl [*R.A.M.*, ix, p. 590] is transmissible by means of an unidentified species of whitefly (Aleurodidae), the period elapsing from the introduction of the insects into the cages to the appearance of the first symptoms varying from 11 to 24 days in six experiments. This indication was confirmed by observations on the relationship between the number of the insects present and the incidence of the disease in field plots of a leaf curl-resistant strain of Ishan cotton (*G. vitifolium*) grown as sole crop, and also with yams, and with groundnuts, which showed that leaf curl was most abundant (1·7 per cent.) in the groundnut plot, where the whitefly population was largest. Counts of Munshi cotton showed that although there were never more than eight adult flies on fifty leaves, as many as 1·8 per cent. of the plants developed leaf curl by the end of September. Whiteflies are present on cotton in Nigeria throughout the whole year, with the exception of December and January. It is thought not improbable that the exceptionally severe outbreak of leaf curl at Ibadan in 1927–8 was due to the presence of considerable numbers of Aleurodidae, which had been breeding on infected Malvaceae in experimental cages.

Some evidence is also adduced that jassids are not likely to be important vectors of leaf curl in southern Nigeria.

MASSEY (R. E.). **Angular leaf spot of Cotton in Egypt.**—*Empire Cotton Growing Review*, vii, 2, pp. 127–128, 1930.

In referring to his previous paper on the angular leaf spot disease (*Bacterium malvacearum*) of cotton in the Sudan [*R.A.M.*, viii, p. 568] and to Fahmy's recent account of this disease in Egypt [ibid., ix, p. 452], the author states that the latest investigations have shown that the contents of cotton bolls can be infected only when visible lesions are present on the bolls. Owing to the mild nature of the disease in Egypt, this degree of infection is rarely attained there, and it is most probable that the slight degree of infection usually found in Egyptian cotton is caused by infected débris left after picking, and from contamination during ginning.

It has been found that in débris *Bact. malvacearum* is protected by a layer of slime, and when this dries it causes the organism to become highly resistant to environmental conditions. Thus, pathogenicity was retained unimpaired when dried bolls with lesions were subjected for 48 hours to temperatures between 70° and 80° C.,

and débris exposed to sun and wind in the field contained the organism in an active state. It is concluded that angular leaf spot in Egypt, and secondary infection (as distinct from the primary infection carried by the seed) in the Sudan, are both traceable to infected débris from the previous season, a suggestion which is confirmed by the fact that external infection of the fuzz and seed has been shown by recent work to be common in the Sudan.

Langeron (M.). **Revue des travaux de mycologie pathologique exotique publiés au cours des années 1927–1928.** [Review of the papers on exotic pathological mycology published in 1927 and 1928.]—*Ann. de Cryptog. Exot.*, iii, 1, pp. 13–42, 1930.

This is a summary review of the chief papers that have been published in 1927 and 1928 on mycotic diseases of man which occur overseas, most of which have been noticed in this *Review*. The papers are classed in the botanical order of the causal organisms, some morphological and cultural details of which are given, together with the nature of the lesions caused by them. The bibliography quoted comprises 90 titles, and a list of the new genera and species mentioned is appended.

Borzone (R. A.). **Un caso de blastomicosis en Santa Fé y ensayo de revisión de las blastomicosis americanas.** [A case of blastomycosis in Santa Fé and an attempt at the revision of the American blastomycoses.]—*An. Soc. Scient. Santa Fé, 1929*, 1, pp. 58–62, 1929. [Abs. in *Bot. Centralbl.*, N.F., xvi, 13–14, p. 432, 1930.]

Coccidioides immitis [*R.A.M.*, ix, p. 180] was isolated from ulcers on a patient suffering from blastomycosis. The fungus developed more rapidly on a solid medium than in liquid; the whitish-yellow colonies are of a stringy type, readily detachable from the substratum, rugose, and cerebriform. The organism develops in and between the granular nodules at the base of the ulcers.

The coccidioidal granuloma caused by *C. immitis* is also known as the 'Podadas-Wernicke disease'. The three other forms of blastomycosis occurring in the Argentine are 'blastomicosis americana' or 'Gilchrist's disease' (*Mycoderma* [*Blastomyces*] *dermatitidis*) [ibid., viii, p. 102], 'Malbran's disease', caused by *Rhinosporidium seeberi* [ibid., ix, p. 242], and the Mazza-Parodi disease, recently recognized to be due to *Pseudococcidioides mazzai*.

Maner (G. D.) & Hammack (R. W.). **Systemic blastomycosis.**—*California and Western Med.*, xxxii, 2, pp. 87–90, 2 figs., 1930.

Full clinical details are given of two fatal cases of systemic blastomycosis, due to *Blastomyces dermatitidis* [see preceding abstract], in adult males (one white and the other a negro) at Los Angeles. Castellani's proposed reclassification of the budding fungi [*R.A.M.*, viii, p. 102] is discussed, with special reference to the suggested identification of *Coccidioides immitis* [see preceding abstract] with *B. dermatitidis*, which the authors cannot accept on morphological grounds.

Aars (C. G.). **Madura foot: its histology and mycology.**—*Arch. of Dermatology*, xxi, 4, pp. 571–574, 3 figs., 1930.

A case of Madura foot with yellowish-white grains [*R.A.M.*, vi, p. 612 *et passim*] is reported in a 41-year-old British Indian woman, born in Dutch Guiana, where there seems to be no previous record of the disease. The causal organism was probably *Actinomyces madurae* (Vincent, 1894), although the growth obtained showed slight differences in cultural and staining properties. The histological picture was that of a typical mycetoma, but X-ray examination showed that the bones were not involved, as is commonly the case in mycetoma vincentii.

Acton (H. W.) & McGuire (C.). **Keratolysis plantare sulcatum, a lesion due to an actinomycotic fungus.**—*Indian Med. Gaz.*, lxv, 2, pp. 53–67, 3 pl. (1 col.), 1930.

The lesion known as keratoma plantare sulcatum (Castellani), a very common condition in the rural districts of Bengal during the monsoon months, has been found to be due to a species of *Actinomyces* closely resembling *A. bovis* [*R.A.M.*, ix, p. 525] in its microscopical characters. The fungus gives rise to a lysis of the horny layer of the thickened epidermis of the soles of the feet, and more rarely of the palms of the hands. Successful cultures were obtained in two out of eight cases, in all of which the fungus was present. The limpet-shaped growth on the surface of the different media used, with deep penetrating, black or red roots, resembles that developing in cultures from cases of Madura foot [see preceding abstract]. Microscopically similar fungi have been found in certain cases of intertrigo, paronychia, and plaque-like hyperkeratosis on the palms and soles.

Catanei (A.). **Étude des teignes dans les agglomérations européennes d'Algérie.** [Study of ringworms in the European colonies of Algeria.]—*Bull. Soc. Path. Exot.*, xxiii, 4, pp. 363–368, 1930.

The writer has extended his studies on the incidence and etiology of ringworm among the inhabitants of Algeria to 285 children (3 to 14 years old) of Spanish and Italian origin in the departments of Oran and Algiers [*R.A.M.*, viii, p. 782]. Out of 20 cases of trichophytosis, 12 were due to *Trichophyton crateriforme*, 6 to *T. glabrum*, and one each to *T. acuminatum* and *T. violaceum*. There were only two cases of favus due to *Achorion schoenleini*.

Iliesco (C.) & Longhin (S.). **Un cas de favus généralisé de la peau et des muqueuses.** [A case of generalized favus of the skin and of the mucous membranes.]—*Ann. de Dermatol.*, Sér. vii, i, 4, pp. 376–379, 1 fig., 1930.

Details are given of a case of generalized favus due to *Achorion schoenleini* [*R.A.M.*, ix, p. 182] in a young Rumanian soldier. On the head the disease was manifested by cicatricial alopecia, while large, greyish-yellow, encrusted lesions covered the body; the nails and buccal cavity were also involved. The patient had communicated the infection to a fellow-soldier, who developed favus in the inguinal region; this fact is considered to be of interest in view

of the rarity of such contaminations, the writers having observed no other case in their extensive hospital experience.

Steinmetz (F. H.). **The control of Carnation rust, Uromyces caryophyllinus (Schr.) Wint., with sulphur.**—*Phytopath.*, xx, 4, pp. 363–364, 1930.

Good control of carnation rust (*Uromyces caryophyllinus*) [*R.A.M.*, vii, pp. 9, 61] was obtained in the greenhouse at the Orono College of Agriculture, Maine, by fortnightly applications of kolodust [ibid., vii, p. 368 *et passim*] from 27th November to 15th April. The flower yield of the treated plants (Arctic and Radiolite varieties) was increased by 158 per cent. Towards the end of the experimental period many of the plants died as a result of excessive soil acidity due to the sulphur applications. This defect could probably be counteracted by judicious applications of lime.

Mix (A. J.). **Further studies of Privet anthracnose.**—*Phytopath.*, xx, 3, pp. 257–261, 1930.

Anthracnose (*Glomerella cingulata*) appears to be quite as prevalent on a variety of privet, named Lodense, newly introduced into the United States, as on *Ligustrum vulgare* [*R.A.M.*, iv, p. 673]. The results of inoculation experiments [which are tabulated and briefly discussed] showed that *G. cingulata* from privet and apple can infect both *L. vulgare* and Lodense privet, the latter being somewhat more susceptible than the former to the apple strain. Lodense privet, therefore, should not be used as a hedge plant in districts where *G. cingulata* is common.

Lemesle (R.). **Observations relatives au Fusarium anthophilum (A.Br.) Wr. parasite du Scabiosa succisa L.** [Notes on *Fusarium anthophilum* (A.Br.) Wr. a parasite of *Scabiosa succisa* L.]—*Comptes rendus Acad. des Sciences*, cxc, 19, pp. 1141–1143, 1 fig., 1930.

The author states that in 1929, in a meadow in the neighbourhood of Nantes, he found *Fusarium anthophilum* attacking numerous plants of *Scabiosa succisa*, the flowers of which were rendered cleistogamous, this being, as far as he is aware, the first record of the disease from France. The fungus attacked all the floral organs inside the corolla, the tissues of which were penetrated by it. The cleistogamous corolla is about double the length of the normal flower bud, the pollen grains in the infected anthers are not affected and always attain maturity, the style is sinuous and thickened, and a direct fecundation of the ovules occurs inside the corolla, instead of fecundation by insect agency as in normal flowers. The conidia formed in the infected flowers are septate and falcate [no measurements are given].

Letow (A. S.). **Über die Bedeutung der Sclerotinia libertiana Fuckel auf Sonnenblumen.** [On the importance of *Sclerotinia libertiana* Fuckel on Sunflowers.]—*Phytopath. Zeitschr.*, ii, 2, pp. 167–180, 2 graphs, 1930.

The writer describes the results of his investigations, conducted at the Voronezh Agricultural Experiment Station during 1929, on

the sunflower (*Helianthus annuus*) disease caused by *Sclerotinia libertiana* [*S. sclerotiorum*: *R.A.M.*, ix, p. 458], the economic importance of which in various parts of Russia is stated to be considerable.

It was found that the density of sowing (within the customary limits) did not affect the incidence of the disease. The crop grown from seed sown on 14th May was more severely affected than that sown on 17th June. Counts were made of the number of sclerotia at various soil depths in eight different plots. It was ascertained that the average number of these bodies per sq. m. to a depth of 20 cm. (below which they were practically absent) was 368. The sclerotia occur, therefore, in the soil layer thrown up by ploughing. They were found to retain their capacity for apothecial formation for three years, irrespective of their origin (under natural or artificial conditions). At a soil temperature of 35° C. the sclerotia germinated on the ninth day, at 25° on the second, and at 15° on the thirteenth. In the presence of abundant moisture they germinated three to seven days earlier than under relatively dry conditions, while no germination occurred in the complete absence of moisture. Fragments of broken sclerotia produce no mycelium in the soil and therefore cannot cause infection of the plants.

The ascospores of *S. sclerotiorum*, like the mycelium and sclerotia, make their best growth at 25°, at which temperature they retain their viability for two months in a dry state. The ascospores do not produce a saprophytic mycelium in the soil, and it was further ascertained by periodical examinations that the mycelium does not develop or overwinter in the soil.

Peltier (G. L.) & Jensen (J. H.). **Alfalfa wilt in Nebraska.**—*Nebraska Agric. Exper. Stat. Bull.* 240, 35 pp., 4 figs., 4 diags., 1930.

A full account is given of the bacterial wilt of lucerne (*Aplanobacter insidiosum* [see above, p. 629], which was first observed in Nebraska in 1925. The most serious losses occur in the irrigated and subirrigated valleys. The disease is readily recognizable by the dwarfing and yellowing of the plants, the bunch-growth effect produced by the many shortened stems, the small, chlorotic, rounded, cupped leaves, and the yellow or brown discoloration in the outer bark of the tap root. The greatest mortality from wilt is apt to occur during the second season after infection, which usually takes place twice a year, in the early spring and in the first half of June. The disease chiefly affects plants of two years old and upwards. The bacteria enter the plants only through wounds and are disseminated by surface irrigation, drainage water, and the cutting bar of the mower. The incidence of wilt may be reduced by suitable cultural measures [which are indicated] and the cultivation of the resistant Hardistan, Turkestan, and Provence varieties.

Siegler (E. A.). **Effect of the Apple strain of the crown-gall organism on root production.**—*Journ. Agric. Res.*, xl, 8, pp. 747–753, 5 figs., 1930.

After a brief reference to his previous work on the apple strain

of *Bacterium tumefaciens* [*R.A.M.*, ix, p. 188], the author gives some details of experiments, the results of which showed that when apple shoots raised from root cuttings or grown from seeds and from which most of the root system had been removed, were inoculated at their cut end with the organism, root production was inhibited and growth of the cuttings was retarded. These results might be interpreted, since the base of such apple shoots is comparable to the base of soft wood cuttings, as indicating that the organism inhibits the production of roots, but in view of the fact that inoculations of apple seedlings and cuttings in other regions often result in excessive production of roots, it is suggested that the organism does not possess, *per se*, either direct root-stimulating or root-inhibiting powers. It is possible that when it is inoculated at a point some distance up from the base of the shoot, the organism, directly or indirectly, causes a girdling effect which is well known in nature to result in the production of roots above the girdled area.

DUTTON (W. C.). **Spraying materials and the control of Apple scab.**—*Michigan Agric. Exper. Stat. Special Bull.* 203, 32 pp., 1930.

The results [which are fully discussed and tabulated] of six years' experiments in the control of apple scab (*Venturia inaequalis*) in central and western Michigan [*R.A.M.*, vi, p. 36; viii, p. 44] indicated that dry-mix sulphur-lime, wettable sulphurs, and various specially prepared sulphur sprays, e.g., colloidal and activated sulphur and sulfocide, are inferior to lime-sulphur for this purpose.

Generally speaking, comparable results were obtained with dry and liquid lime-sulphur used on the basis of 4 lb. of the former containing about the same amount of active ingredients as 1 gallon of the latter. In some cases, however, a 4·7 to 1 ratio was necessary to give an equivalent amount of total sulphur and 5 to 1 for total polysulphides. The data show definitely that 4 lb. or more of dry lime-sulphur are required to equal 1 gallon of the liquid mixture.

The addition of lime, casein spreader, or iron sulphate to liquid and dry lime-sulphur failed to increase the fungicidal value of the spray. The results obtained with a combination of aluminium sulphate, lime-sulphur, and lead arsenate were not satisfactory, while the value of calcium arsenate in scab control also appears doubtful from these experiments. The toxicity of the lime-sulphur was increased, however, by the addition of lead arsenate. Weak Bordeaux mixture generally gave adequate control, but in some cases it was necessary to use concentrations exceeding 2–2–100 to ensure the efficacy of this treatment. The omission of lime-sulphur in the post-blossom treatments is considered undesirable, since in certain seasons the development of scab may persist well into the summer.

SCHAARSCHMIDT (W.). **Schorf und Obstmade an Äpfeln. Versuche zur Einträglichkeitsbestimmung von Bekämpfungsmassnahmen.** [Scab and fruit moth on Apples. Experiments to

determine the economic value of control measures.]—Reprinted from *Mitt. Deutsch. Landw. Gesellsch.*, [xlv], 9–10, 4 pp., 1930.

Full details, accompanied by tables, are given of a series of experiments in the combined control of scab [*Venturia inaequalis*] and codling moth [*Cydia pomonella*] on 63 Winter Golden Pearmain standard apple trees at Marienthal a. d. Ahr [Rhine Valley]. The following six preparations were used: (1) Bordeaux mixture (1 per cent.); (2) Bordeaux mixture + lead arsenate 'Silesia' (Güttler) (1 per cent.); (3) Bordeaux mixture + Spiess arsenical spray (0·4 per cent.); (4) Bordeaux mixture + 1/29 (0·5 per cent.); (5) kublarsenat Spiess; and (6) arsotax dust (Heyden), while a seventh plot was left untreated as a control. The treatments were applied on 14th and 29th May and 10th June.

The best control of scab (3·07 per cent. infection compared with approximately 50 per cent. in the untreated plot) was given by arsotax, the first application being omitted. The results given by Bordeaux mixture and kublarsenat (about 4 and 5 per cent. scab, respectively), were also very satisfactory. The costs of a combined treatment (three applications) with the liquid preparations amount to about M. 1 per tree; the figure for the dust is somewhat higher (M. 13·70 per plot of nine trees), but this is counterbalanced by the saving of labour. All the treatments were more or less profitable from an economic standpoint, the increased yield as compared with the control plot amounting in most cases to over 60 per cent.

Horne (A. S.). **Biological work.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1929*, pp. 125–140, 7 graphs, 1930.

After reviewing the results obtained in his earlier investigations into the resistance of stored apples to invasion by *Cytosporina ludibunda* [*R.A.M.*, ix, p. 42], the author states that the phenomenon known as 'interference', in which fungal invasion is checked after relatively slight progress from the point of inoculation, was observed under circumstances [which are described] which indicated that it is related to the level of resistance of the apple, and is not solely an effect due to some action of the fungus.

To ascertain the effect of temperature upon the rate of fungal invasion, batches of Cox's Orange Pippin apples were inoculated with two strains, A and D, of *Fusarium* [*fructigenum*] on opposite sides at weekly intervals, and stored at 5°, 10°, 15°, and 22° C. The daily rates of advance of each strain of the fungus are tabulated and the mean daily radial advance is plotted against temperature. The maximum gradient of both curves lies between 10° and 15°.

Previous researches having indicated that a correlation exists between the rate of fungal invasion and the nitrogen content of the apple [loc. cit.], a further test was made, in which one hundred Cox's Orange Pippins were selected at random, and two approximately similar halves of each were marked with the same number. Each apple was then inoculated on one side in the equatorial region with *Fusarium* strain D, so that the point of inoculation was

always at the top of the half. Each apple was then halved vertically and the inoculated half sealed in wax. The uninoculated halves were cut up and the cut pulp of each half was divided into three portions, two of which were kept in alcohol for estimations of sugars and acids, while the third was dried and kept for estimations of nitrogen. The inoculated halves were kept for 16 days under known conditions of temperature and humidity, after which the weight of decayed tissue was estimated. From the data so obtained the radial advance in millimetres was calculated, the apples being grouped into five classes according to the length of fungal advance; the measurements made are tabulated in terms of percentage of weight of fresh apple at the time of inoculation under the following heads for each class: dry weight, alcohol-insoluble material, acid (as malic), total sugars, reducing sugars, sucrose, total nitrogen, ash, and potash. From these it was ascertained that only the nitrogen values ran parallel with those for radial advance; passing from the lowest to the highest class of advance, the nitrogen content of the apples in class V was nearly double that in class II.

To test the validity of the relationship previously established [ibid., vii, p. 585] as regards the resistance of opposite sides of individual apples when applied to the Cox's Orange Pippins used in the half-apple experiments, an additional hundred were inoculated at two points on opposite sides with *Fusarium* strain D, the half-apple and whole-apple experiments running parallel. The first side inoculated was marked, the second inoculated side corresponding to the half set aside for chemical analysis in the previous test. The rate of radial advance for the marked and unmarked sides was calculated separately. The tabulated results show a remarkable correspondence between the values for the mean radial advances for the half apples in the five classes and the mean radial advances for the marked side of the whole apples, the figures being, respectively, 9·95 and 9·84 mm. Also, when the mean radial advances for one side of the whole apples were arranged in order of increasing values, the mean radial advances for the opposite side fell into a corresponding order, which was also the order of increasing nitrogen content.

These results are considered definitely to establish the importance of the nitrogen content in determining the rate of radial advance of fungal attack.

Horne (A. S.) & Das Gupta (S. N.). **Relative power of attacking Apples shown by certain strains of Diaporthe, Cytosporina and Phomopsis.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1929*, pp. 140–144, 1930.

Tests made to ascertain the relative power of attacking Bramley's Seedling apples shown by certain species of *Diaporthe* and *Phomopsis* gave the following results. All the species tested were capable of attack. *D. faginea*, *D.* sp., *D. arctii*, *D. binoculata*, and *D. pseudotsugae* were much less active than *D. perniciosa*. *P. coneglanensis*, *P. californica*, *P. mali*, and *Cytosporina ludibunda* [see preceding abstract], which morphologically appear to be allied to the *Cytosporina-Phomopsis* group of saltants [*R.A.M.*, ix, p. 547],

were also in general agreement with them as regards attacking powers. *P. coneglanensis* was, however, more active than any member of the saltant group, the daily rate of invasion (0·187 cm.) exceeding that recorded for *D. perniciosa* (0·177 cm.). *P. mali* (0·1074 cm.) was slightly more active than the saltant CA_2 (0·0875 cm.), while *P. californica* (0·0465 cm.) and *Cytosporina ludibunda* (0·0472 cm.) fell into an intermediate position between the saltants CC (0·036 cm.) and CA_3 (0·069 cm.).

TROUT (S. A.). **The action of acetaldehyde upon fruit.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1929*, p. 59, 1930.

In studies of the physiological effect of acetaldehyde on fruit and the part played by acetaldehyde in normal respiratory metabolism it was ascertained that acetaldehyde vapour is absorbed by healthy fruit and disappears in the tissues. Healthy fruit can be treated without ill effects with concentrations of acetaldehyde, which are fatal to fungal spores on its surface and to fungal mycelium [see next abstract].

TOMKINS (R. G.). **The effect of acetaldehyde on the growth of moulds.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1929*, pp. 57–59, 1930.

When dry spores of *Botrytis cinerea*, *Monilia* [*Sclerotinia*] *cinerea*, *Penicillium digitatum*, and *P. italicum* were sown on dried nutrient agar on a glass slide suspended in air in a bottle containing water or a watery solution of acetaldehyde at various concentrations and kept at a constant known temperature [cf. *R.A.M.*, ix, p. 262], at all the temperatures tested the presence of acetaldehyde delayed the appearance of germ-tubes, while at any given temperature the latent period of germination increased with an increase in the concentration of the acetaldehyde. The higher the concentration of acetaldehyde the slower was the rate of elongation of the germ-tubes. Concentrations between 3 and 5 in 10,000 usually inhibited germination, but when the spores were removed to atmospheres free from acetaldehyde they began to germinate. The concentration necessary to inhibit germination varied with the temperature, a concentration of 5 in 10,000 inhibiting the germination of *S. cinerea* at 10° C. but failing to do so at 25°, while one of 2 in 10,000 inhibited the germination of *B. cinerea* at 10° though one of 4 in 10,000 was required at 25°.

The spores were also exposed for various periods to acetaldehyde vapour from solutions of different strengths between 1 in 100 and 1 in 1,000, and subsequently removed to air free from acetaldehyde. It was found that the spores in any one sample were not all killed at the same rate, but that killing was a function of the concentration of the acetaldehyde, temperature, and the duration of exposure. All were killed by 1 in 100 in 3 hours at 23° and 9 hours at 10°, but it took 120 hours to kill all when the concentration was 1 in 1,000 at 23° and more than 500 hours at 10°.

The higher the concentration the longer was the time required to establish a colony, and, in the early stages, the slower was the rate of spread.

Bottini (E.). **Sull' attitudine di alcune varietá di Pere alla conservazione in frigorifero.** [On the reaction of certain Pear varieties to preservation in cold storage.]—*Ann. R. Staz. Chim.-Agr. Torino,* x, pp. 194–223, 1928. [Abs. in *Riv. Pat. Veg.,* xx, 3–4, p. 106, 1930.]

Scald of pears in cold storage is stated to be especially common among Italian varieties on Curato and Butirre d'Arras, both of which are very susceptible to internal breakdown, as are Meraviglie d'Italia and Martin secco.

Němec (B.). **Tumoren an den Wurzeln der Pflaumen.** [Tumours on the roots of Plums.]—Reprinted from *Věstník Král. Čes. Spol. Nauk,* ii, 13 pp., 16 figs., 1929. [English summary. Received August, 1930.]

Full details are given of the author's histological and cytological examination of the pea- to walnut-sized tumours found on the roots of plum trees in various districts of Czecho-Slovakia.

In view of the necessity of differentiating between bacteria and mitochondria, the material was fixed with two preparations, viz., (1) 100 c.c. chromic acid and 8 c.c. neutral formalin, and (2) 50 c.c. potassium bichromate, 50 c.c. chromic acid, and 8 c.c. neutral formalin. The former proved very satisfactory for the fixation of bacteria but less so for that of the mitochondria, while the latter was equally good for both. Heidenhain's haematoxylin stained both bacteria and mitochondria, while the Gram process was also useful for the former. In plum trees there is little risk of confusing bacteria and mitochondria, but in the tumours of other plants it may be necessary to use Milovidov's differential stain (*Arch. d'Anat. Micr.*, xxiv, 1928).

The cytoplasm of cells in the tumours was found to contain various types of bodies, viz., weakly staining, minute fibres, often swollen at one end (mitochondria); globular or ellipsoid structures (leucoplasts, some of which contained starch grains); and deeply stained rods, threads, or grains, slightly thicker than the mitochondria and mostly collected in groups or sometimes forming long strands. The last-named bodies are evidently bacteria, as indicated by their fairly uniform shape and occurrence in aggregations instead of being diffused through the cytoplasm, as in the case of chondriosomes. In sections stained by Milovidov's differential method, the mitochondria are red and the bacteria blue. The bacteria were detected mostly in the peripheral cells of the tumours, though a certain number also occurred elsewhere, i.e., in the older parenchyma cells, the long prosenchymatous cells of the vascular bundles, the parenchymatous sheath of the latter, the sieve-tubes and their companion cells, and the meristematic cells of the interfascicular cambium, when present. No bacteria were observed in the intercellular spaces.

It was not possible to determine the manner in which the bacteria spread from cell to cell, whether by actual migration through the cell walls or by passive dispersal through the division of the cells in which they are contained.

[The nature of the tumours is not specified, but they appear to

have been taken as probably crown gall, caused by *Bacterium tumefaciens*.]

Mix (A. J.). **Brown-rot leaf and twig blight following Peach-leaf curl.**—*Phytopath.*, xx, 3, pp. 265–266, 1930.

In a previous paper [*R.A.M.*, iii, p. 659], the writer drew attention to the common invasion of peach leaves infected by *Exoascus* [*Taphrina*] *deformans* by other fungi after the dispersal of the ascospores. Such organisms, which include species of *Alternaria*, *Fusarium*, and *Cladosporium*, accomplish the final destruction of the leaf, but have never been observed to pass from the curled to the healthy portion. In June, 1928, it was noticed that nearly all the curled shoots of peach trees in unsprayed orchards round New Haven, Connecticut, were in process of destruction by *Sclerotinia fructicola* [*S. americana*: ibid., viii, p. 386] which, in contrast to the above-mentioned fungi, was passing from the diseased to the healthy portions of the leaves and twigs. In some cases healthy leaves in contact with curled ones were also being attacked by the brown rot fungus.

Mix (A. J.). **A blight of flowering Almond, Prunus glandulosa Thunb.**—*Phytopath.*, xx, 3, p. 265, 1930.

The *Monilia* stage of the common brown rot fungus, *Sclerotinia fructicola* [*S. americana* · see last abstract], was isolated from the blighted leaves and twigs of the flowering almond (*Prunus glandulosa*) at Lawrence, Kansas, where the disease has been observed for the past three seasons. In cultural and morphological characters this strain of the fungus closely resembled those isolated from cherry and apple. Sound peach, plum, and apple fruits developed typical brown rot on inoculation with the *Monilia* from cherry, apple, and flowering almond. Blossom and leaf blight of the last-named resulted when cut shoots with opening blossoms were sprayed with spore suspensions of *S. fructicola* and kept under moist conditions. This is believed to be only the second record of the disease, the first being from Connecticut in 1898. Careful pruning appears to give adequate control.

Jenkins (W. A.). **The Cherry leaf-spot fungus, Mycosphaerella cerasella Aderh., its morphology and life-history.**—*Phytopath.*, xx, 4, pp. 329–337, 2 figs., 1930.

Cultivated cherries in North Carolina are liable to premature defoliation by the conidial form of a fungus commonly known as *Cercospora cerasella* Sacc. [*R.A.M.*, ii, p. 416]. The centres of the lesions, which measure 1 mm. or more at maturity, are reddish, with paler borders. The necrotic tissues gradually become dry and brittle, and the lesions, if numerous, may coalesce to form large, irregular, dead areas. In severe cases serious defoliation occurs.

The present study, extending over the past two years, deals with the development of the fungus in leaves (natural and artificial inoculations) and in artificial cultures, with special reference to the morphology and genetic relations of the several stages. The germ-tubes from conidia sown on the surface of living leaves enter the tissues by direct penetration. The mycelium is at first confined to

the intercellular spaces, but on the death of the cells it enters them. The conidiophores develop on both leaf surfaces from compact masses of stromatic tissue formed subcuticularly or within the substomatal cavities. The conidiophores are brown, geniculate, flexuose, and measure 30 to 40 μ in length, and the conidia abjointed from the tips are obclavate, bent, light brown, septate, guttulate, and measure 40 to 60 by 3 to 4 μ.

Spermogonia are formed on both surfaces of fallen leaves throughout the autumn and early winter; they originate either within old conidial stromata or in separate stromata developing after the death of the foliage. The spermogonia are globular to flask-shaped, black, ostiolate, and measure 36 to 93 by 25 to 72 μ. The spermatia are produced endogenously, usually in fours within spermatiferous cells; they are hyaline, rod-shaped, and measure 2·5 to 2·7 by 0·9 to 1 μ. The method of spermatial formation appears to resemble that described by Higgins for *Mycosphaerella bolleana* on fig and *M. personata* on grape [ibid., viii, p. 703].

The ascigerous stage, *M. cerasella* Aderhold, developed on fallen cherry leaves from March to September. The densely aggregated, amphigenous, innate (later erumpent), globose, black perithecia measure 60 to 120 μ in diameter; the clustered, bluntly clavate-cylindrical, aparaphysate asci are 40 to 60 by 8 to 10 μ and contain eight imperfectly biseriate, slightly curved, hyaline, unequally bicellular ascospores, the upper cell somewhat larger than the lower, measuring 13 to 17 by 3 to 4 μ.

The genetic connexion between the three stages described above is traced. Spermogonial and perithecial primordia were observed to arise in the basis of conidial stromata within fallen leaves, while the characteristic thick-walled, brown mycelium extends from the conidiophore bases and also from spermogonia and perithecia. Typical *Cercospora* conidia developed (under certain conditions which are outlined) in artificial cultures made from ascospores. Small cherry trees inoculated with ascospores developed mature lesions in three weeks, bearing conidia of *C. cerasella*.

KLEBAHN (H.). **Die Monilia-Krankheit der Kirschen.** [The *Monilia* disease of Cherries.]—*Die Kranke Pflanze*, vii, 3–4, pp. 37–40, 1 fig., 1930.

A popular account is given of the cherry disease caused by *Monilia* [*Sclerotinia*] *cinerea*, which is stated to cause heavy and widespread damage in the Hamburg district, especially on shade Morellos [*R.A.M.*, viii, p. 254]. The control of the disease presents great difficulties, and none of the methods hitherto adopted has proved successful. The importance of further investigations on possible measures of combating the fungus is urged.

MURPHY (P. A.). **Experiments on the control of American Gooseberry mildew.**—*Journ. Dept. Agric.*, Dublin, xxix, 2, pp. 188–204, 1930.

Details are given of two series of experiments in the control of the American mildew of gooseberry (*Sphaerotheca mors-uvae*) [*R.A.M.*, ix, p. 394], the first of which was conducted from 1925 to 1927, inclusive, in a badly diseased and practically moribund plan-

tation of about 250 bushes at Mount Melleray, Co. Waterford, Ireland, and the other from 1927 to 1929 in several other localities. At Mount Melleray spraying of the bushes increased the yield from nil in 1924 to 181 lb. in 1925 (with an infection of less than 1 per cent. of fruit) and to 544 lb. in 1926 (with an infection of the fruit ranging from 0 to 0·7 per cent.). It is pointed out that in those two years the disease was mild owing to climatic conditions; in 1927, however, the outbreak was very severe, and while the yield of the bushes was maintained at the same level as in 1926 the infection of the fruit was not controlled to the same extent as in the previous years; three applications of 1 in 100 lime-sulphur reduced it, however, to 13·4 as compared with 88·9 per cent. in the controls. The maximum improvement in the condition of the bushes was apparently attained in the second year of the treatment.

Among the spray mixtures tested, 1 in 100 lime-sulphur gave the best control without injury to the foliage, while at 1 in 60 it was liable to scorch the leaves. Ammonium polysulphide 1 in 120 was about as effective as lime-sulphur, but is slightly more costly. Alkaline Burgundy mixture was found to injure the foliage in the first year of the tests, and was therefore discarded in the further experiments. The addition of a spreader to the spraying mixture did not appear materially to increase its efficacy. During the severe outbreak of 1927, three applications of the spray were necessary to obtain satisfactory control, but the results of the tests in the two preceding years indicate that in normal seasons one or two applications are sufficient. Post-blossom applications appeared to be more effective than the pre-blossom one.

These results were largely confirmed by the second series of experiments, in which three sprayings reduced the diseased crop from 67·7 to 8·3 per cent. in 1927, and from 77·2 to 6·9 per cent. in 1928. The results in 1929 were similar.

For general practice the use of lime-sulphur 1 in 100 or ammonium polysulphide 1 in 200 is recommended; up to three applications should be made, according to the weather, beginning after blossoming. Spraying should be supplemented by the removal of the tips of new shoots early in September. In the case of young bushes, later spraying is advisable to keep them in good condition for the next year.

König (C.). **Solbar gegen die Fleckenkrankheit der Himbeere.** [Solbar against the spot disease of the Raspberry.]—*Ratschläge für Haus, Garten, Feld*, v, 5, pp. 51–53, 3 figs., 1930.

Popular notes are given on the symptoms and control of cane blight of raspberries (*Didymella applanata*) [*R.A.M.*, ix, p. 117], which is stated to be spreading rapidly in certain districts of Germany. Directions are given for the control of the disease by cultural measures and treatment with solbar (3 per cent. for the dormant application and 1 per cent. thereafter).

Ward (F. S.). **Banana growing in Malaya and the presence of diseases.**—*Malayan Agric. Journ.*, xviii, 2, pp. 63–70, 5 pl., 1930.

After referring to the history of the cultivation of the banana

in various parts of the world the author briefly describes the conditions under which it is grown by the Chinese in Malaya, and gives an annotated list of the chief varieties cultivated there. The districts concerned are comparatively free from serious disease; Panama disease (*Fusarium cubense*), the worst outbreaks of which occur during wet weather, though endemic, shows no sign of reaching alarming proportions, several good commercial varieties being as yet unaffected. The most susceptible are the commercially important Pisang Embun, the local Pisang Restali and, to a less extent, Pisang Talon. The peculiar bacterial wilt which affected Pisang Restali in Johore recently [*R.A.M.*, vii, p. 653] has now disappeared.

Streeter (L. R.) & Rankin (W. H.). **The fineness of ground sulfur sold for dusting and spraying.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 160, 16 pp., 3 figs., 1930.

Most of the ground sulphur manufactured for use as a dust fungicide or suspended as a spray mixture is stated to comply with the accepted '300-mesh' standard. However, one out of six brands examined by the writers and labelled 'superfine' was found to contain 23 per cent. by weight that would not pass through a No. 325 sieve of the United States Sieve Series established by the Bureau of Standards. The other five brands were found to be uniform as far as sieving tests showed. The 1 or 2 per cent. that failed to pass through a No. 325 sieve after conditioning represented unbroken aggregates rather than large particles. The sieving method was found to be accurate in detecting the inferior grades of sulphur, but is limited to separating the fraction composed of particles larger than about 50 μ; a microprojection method was therefore developed for more accurate tests. By measuring large numbers of sulphur particles dispersed in liquid, the weight of sulphur of different grades of fineness was determined. Five brands, all free from particles larger than 50 μ, varied from 74 to 96 per cent. by weight of material, the particles of which were finer than 27 μ, and from 38 to 84 per cent. finer than 18 μ.

Assuming that sulphur particles larger than 27 μ (No. 600 theoretical sieve size) will fail to adhere to foliage for any length of time, the brand containing 96 per cent. of its sulphur in a finer condition than this is obviously a more effective product than that containing only 74 per cent. The finest brand examined, in which 84 per cent. by weight of the material was less than 18 μ, is certainly a superior product from the standpoint of adherence. Most of the other brands, while complying with accepted standards, could be improved with regard to fineness.

Borchert. **Untersuchung über die Giftwirkung kupferhaltiger Verbindungen bei den Bienen.** [Investigation on the toxic action of copper-containing compounds on bees.]—*Berliner tierärztl. Wochenschr.*, i, p. 84, 1930. [Abs. in *Fortschr. der Landw.*, v, 11, p. 399, 1930].

Bees in lots of 100 were fed on copper-containing plant pro-

tectives, copper sulphate, and basic copper carbonate (+powdered sugar and honey water) in varying concentrations, and the concentration at which 25 per cent. of the insects were killed was determined. The *dosis toxica* of five copper-containing fungicides was 8·8 millionth gm. of metallic copper, and the figures for the other copper compounds were approximately the same. These disinfectants being naturally bitter and not as a rule artificially sweetened, the danger to bees from their use may be considered negligible.

LOUNSKY (J.). **A propos de fongicides et de procédés de désinfection.** [Concerning fungicides and methods of disinfection.] —*Ann. de Gembloux*, xxxvi, 4, pp. 121–127, 1930.

This is a review of some of the more important recent developments in seed disinfection, with special reference to the treatment in Belgium of beet clusters against blackleg [*Phoma betae* and other organisms: *R.A.M.*, ix, p. 152] and cereal seed-grain against various seed-borne diseases. In connexion with the first-named disease, recent experiments at Gembloux have shown that a larger quantity of copper carbonate (20 gm. per kg.), resulting in a superior stand to that obtained with 8 to 10 gm., may be given where the seed-clusters have been slightly moistened before treatment.

The following figures have been calculated for the cost (exclusive of labour), of the various treatments applied in Belgium for the control of wheat bunt [*Tilletia caries* and *T. foetens*], snow mould of rye [*Calonectria graminicola*], and stripe disease of barley [*Helminthosporium gramineum*], all per 100 kg.; dusting with copper carbonate, fr. 4 for wheat and rye and fr. 7 for barley; abavit B, fr. 8 for wheat and rye; tillantin, fr. 18 for wheat and rye and fr. 24 for barley; tutan, fr. 19·20 for wheat and fr. 25·60 for rye; germisan (short disinfection process), fr. 7·80 for wheat and rye and fr. 9·75 for barley [cf. ibid., ix, p. 27].

DOYER (LUCIE C.). **Iets over den gezondheidstoestand der zaaizaden in verschillende jaren.** [Notes on the state of health of seed material in different years.]—*Tijdschr. over Plantenziekten*, xxxvi, 4, pp. 65–74, 1930.

Some general observations are made on the incidence of fungous, bacterial, and insect infection of seeds of various economic crops in Holland in different years. The diseases discussed include *Botrytis cinerea* and *Colletotrichum linicolum* [*C. lini*] on flax, the latter being particularly severe in 1927, when over 50 per cent. infection was recorded on 6 per cent. of the samples examined; *Ascochyta pisi* on peas, liable to cause over 50 per cent. infection; bacterial diseases, *Macrosporium*, and mosaic of beans [*Phaseolus vulgaris*]; *Phoma betae* on beets, which has been well controlled by two hours' immersion in 0·5 per cent. germisan; *Fusarium* spp. on cereal seed-grain (of very slight importance in 1928 and 1929), wheat bunt [*Tilletia caries* and *T. foetens*]; and barley stripe [*Helminthosporium gramineum*].

Cortina (F. V.). **Il servizio fitopatologico in Libia.** [The phytopathological service in Lybia.]—*Rivista Agricola*, xxvi, 585, p. 174, 1930.

This is a notification of the establishment, by Royal Decree of 16th January, 1930, of a phytopathological service in the Italian colony of Lybia, with headquarters in Tripoli and Bengasi. A brief enumeration is also made of the duties and powers of the various officers of the service and of the general scope of the work.

Cook (M. T.). **The effect of some mosaic diseases on cell structure and on the chloroplasts.**—*Journ. Dept. Agric. Porto Rico*, xiv, 2, pp. 69–101, 12 pl., 1930.

This paper is a record of comparative studies by the writer and others on mosaic and healthy plants of sugar-cane, *Canna indica*, tobacco, tomato, and cowpea. The investigations are concerned wholly with the cell structure and cell contents of the chlorotic areas as compared with the green parts of the same plants and with healthy individuals [cf. *R.A.M.*, vii, p. 198]. Studies of actual lesions are not included.

The active agent inhibits the differentiation of the cell structure from the time it reaches the meristematic tissue, which remains in the stage of development in which it was at the moment of infection. The spread of the virus through the leaf appears to be very uneven, a fact which explains the mottling and variations in development in different parts of the leaf. The reaction of the leaf may depend on its age at the time of infection or on the virulence or amount of the active principle, but the variations in both thickness and cell structure in a single leaf, and sometimes within a single area, indicate that the virus may be unequally distributed throughout the plant or one of its organs. This conjecture is substantiated by the numerous records of plants (especially tobacco) in which the symptoms were exclusively unilateral, and of leaves showing more severe damage on one side than on the other.

There is no reason to believe that the cell structure is actually modified by the virus, the effects of which are limited to the inhibition or retardation of development. The chlorotic areas increase in size as a result of cell division and not, as far as could be observed, in consequence of the spread of the virus into the green cells adjoining the chlorotic areas. The development of the plastids is inhibited both as regards size and number. The chloroplasts of mosaic plants may, however, subsequently increase in dimensions and numbers with age and exposure to sunlight; no evidence of their disintegration, so frequently reported by other workers, could be found. In cases of non-infectious chlorosis the plants did not turn green with age, nor did the chloroplasts increase in size and number with age and exposure to sunlight.

Dunlap (A. A.). **The total nitrogen and carbohydrates, and the relative rates of respiration, in virus-infected plants.**—*Amer. Journ. of Botany*, xvii, 5, pp. 348–357, 1 fig., 1 diag., 1930.

An investigation was conducted at Wisconsin University to

determine the effects of mosaic of tobacco, tomato, pokeweed (*Phytolacca decandra*), cucumber, and raspberry ; yellows of peach [*R.A.M.*, ix, p. 463], plum, aster [ibid., viii, p. 553], and ragweed (*Ambrosia artemisiifolia*) ; and leaf curl of raspberry, on the total nitrogen and carbohydrate contents and on the respiratory process in the leaves of the respective hosts. Most of the materials were collected in the field in Connecticut during the summer of 1928, but the peach and plum trees were artificially inoculated.

The results of the experiments [the technique of which is fully described and the analytical data tabulated] showed that the mosaic diseases were accompanied by an increase in the total nitrogen and a decrease in the total carbohydrate contents of the foliage, while the reverse was true in the case of yellows. The carbohydrate to nitrogen ratio was decreased in the mosaic leaves and increased in those affected by yellows. The diseases of the latter group caused greater variations in the amounts of constituents in the leaves of their hosts than did the mosaics. There was an increase of respiration in young tissues infected by virus diseases, while in the older diseased leaves respiration was less than in healthy material.

Schaffnit (E.) & Meyer-Hermann (K.). **Beiträge zur Kenntnis der Wechselbeziehungen zwischen Kulturpflanzen, ihren Parasiten und der Umwelt. (3. Mitteilung.) Über den Einfluss der Bodenreaktion auf die Lebensweise von Pilzparasiten und das Verhalten ihrer Wirtspflanzen.)** [Contributions to the knowledge of the interrelations between cultivated plants, their parasites, and the environment. (Note 3.) On the influence of the soil reaction on the mode of life of fungous parasites and the behaviour of their hosts.]— *Phytopath. Zeitschr.*, ii, 2, pp. 99–166, 18 figs., 3 graphs, 1930.

In connexion with a study [which is fully described] on the modifications induced by different types of soil reaction in the mode of life of various parasitic fungi and in the relations between these organisms and their hosts, the writers undertook a series of soil inoculation experiments with *Plasmodiophora brassicae* on kohlrabi [*Brassica oleracea* var. *caulo-rapa*], *Synchytrium endobioticum* on potato, *Rhizoctonia* [*Corticium*] *solani*, *Phoma betae*, and *Pythium de Baryanum* on beets, *Moniliopsis aderholdi* on kohlrabi, *Thielavia basicola* on lupin and tobacco, *Calonectria graminicola*, *Fusarium culmorum*, *F. avenaceum*, *F. herbarum*, and *F. equiseti* on winter rye, *Helminthosporium sativum* on winter wheat and barley, and *Ophiobolus graminis* and *O. herpotrichus* on summer wheat. Observations were further made on the saprophytic growth in the soil of the above-mentioned organisms (except *Plasmodiophora brassicae* and *S. endobioticum*), together with *R. violacea* [*Helicobasidium purpureum*], *F. aurantiacum*, *F. polymorphum*, and *Typhula graminum*.

Some of the practical applications of the results obtained in these experiments may be summarized as follows. The optimum hydrogen-ion concentrations for the growth of *H. purpureum* (mycelium) and *S. endobioticum* (germination of resting sporangia)

were distinctly on the acid side; the former developed most copiously at P_H 4·16 and ceased to grow at P_H 7·38, while the latter produced scarcely any galls on the aerial organs of Industrie and Deodara potatoes under strongly alkaline conditions. Nevertheless, the capacity of *S. endobioticum* for forming galls on the underground parts of the plants, even in the presence of a highly alkaline reaction (P_H 7·22), precludes its practical control by heavy applications of lime. The pathogenicity of *C. solani*, *Phoma betae*, *M. aderholdi*, *Thielavia basicola*, *F. culmorum*, *F. avenaceum*, and *H. sativum* is apparently unaffected by the soil reaction.

Calonectria graminicola, *Typhula graminum*, and *O. graminis* are dependent for their development on an alkaline soil reaction, the two former being unable to grow in acid soils, while the latter, though possibly able to survive for a time under such conditions, was found to cause little damage to winter wheat at P_H 4·81 and 4·03.

In order to prevent serious losses from *Plasmodiophora brassicae* the soil reaction should be adjusted to P_H 7·5.

In conclusion, attention is drawn to the importance of plentiful applications of phosphoric acid and nitrogen, both of which assist the regenerative processes, in the control of diseases caused by soil parasites.

JANCKE (O.). **Die Anfälligkeit verschiedener Pflanzen gegenüber tierischen und pflanzlichen Schädlingen und die Wasserstoffionenkonzentration ihres Zellsaftes.** [The susceptibility of various plants to animal and plant pests and the hydrogen-ion concentration of their cell sap.]—*Phytopath. Zeitschr.*, ii, 2, pp. 181–198, 1930.

The results [which are discussed and tabulated] of a series of experiments to determine the connexion (if any) between the hydrogen-ion concentration of the cell sap of certain plants and their resistance or susceptibility to various insect and fungous pests showed no such correlation in the case of vine downy mildew (*Plasmopara*) [*viticola*] [*R.A.M.*, vi, p. 683] and apple mildew (*Podosphaera leucotricha*).

HARVEY (R. B.). **The relative transpiration rate at infection spots on leaves.**—*Phytopath.*, xx, 4, pp. 359–362, 3 figs., 1930.

It was found possible to use the accumulation of such non-toxic dyes as Light Green S.F. to demonstrate the effect of certain local fungous infections on transpiration from leaves. Local infections by *Septoria* [*apii*] on celery leaves show dry, brown, corky areas of cells killed by the fungus. When the petioles of infected leaves are placed in 0·1 per cent. aqueous solution of Light Green S.F. or similar preparations there is an accumulation round the infection spots, in a zone 1 mm. or so wide in the surrounding live cells, indicating that the dead cells do not evaporate the aqueous dye solution so rapidly as do the areas into which the fungus is spreading. In the case of Hubbard squash [*Cucurbita maxima*] infected by mildew (*Erysiphe* sp.) the spots on the lower (but not the upper) surface were sharply outlined by deep-coloured areas

within the leaf, denoting an increased rate of transpiration. An accumulation of dye was further observed round the rust pustules of *Puccinia graminis* on wheat, the colour being particularly deep where the epidermis was broken.

MORITZ (O.). **Studien über Nectriakrebs. I. Infektionsversuche.** [Studies on *Nectria* canker. I. Inoculation experiments.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 5, pp. 251–261, 1930.

A full account, accompanied by tables, is given of the writer's investigations on the perthophytic virulence of 22 strains of *Nectria* collected from various hosts in different parts of Germany and also at Baarn (Holland). [Perthophytism (a subdivision of necrophytism) has recently been defined by Münch as the condition in which the dead substratum consists of parts of the living host either killed by the fungus in advance of its growth or that have become naturally non-living: *R.A.M.*, ix, p. 47.]

There was no indication of host specialization among the different strains, those perthogenic on apple also infecting a number of other trees. On the other hand, marked variations were observed in the degree of virulence manifested by the strains from divergent sources. Thus, the highly virulent strain XII (*N. galligena*) from apples at Stadthagen [Lippe] is readily transferable to beech, *Carpinus*, *Salix*, *Alnus*, *Pyrus aria*, *Crataegus oxyacantha*, *Acer pseudoplatanus*, poplar (*Populus*), and birch (*Betula*). Strain III (from Baarn), non-perthogenic on apple, also failed to produce bark canker on any of the other hosts.

It is considered probable that the perthogenic principle of *Nectria* is an agent capable of inflicting damage on the cells generally, while resistance is conferred by a faculty in the host for speedy regeneration.

A strain of known medium virulence should be used in inoculation experiments on fruit varieties when testing resistance to canker. Inoculations on non-wounded stems gave positive results on Landsberger Reinette apple trees grown under very moist conditions.

The results of these experiments differ in certain respects from those obtained by Richter [ibid., vii, p. 676]. Thus, *N. coccinea* was found to be capable of producing true canker, while a number of strains of *N. galligena* were non-perthogenic.

BIOURGE (P.). **La vraie cause de la dégénérescence de la Pomme de terre. Non pas virus filtrant mais microbe (Bac. ruber N. et L.).** [The real cause of degeneration in the Potato not a filtrable virus but a microbe (*Bac. ruber* N. et L.).]—Reprinted from *Agricultura*, 7 pp., 3 figs., 1930.

The author gives a short account of observations and experiments which lead him to claim that various types of potato diseases, including blackleg ('jambe noire'), black heart of the tubers, blueing of the latter [*R.A.M.*, ix, p. 53], mosaic, leaf roll, and wilt are all caused by *Bacillus ruber* N. & L.

LEACH (J. G.). **Potato blackleg: the survival of the pathogene in the soil and some factors influencing infection.**—*Phytopath.*, xx, 3, pp. 215–228, 2 figs., 1930.

This is an expanded account of the writer's investigations on the biology of the potato blackleg organism (*Bacillus phytophthorus*) with special reference to Minnesota conditions [*R.A.M.*, ix, p. 402]. Exposures to temperatures of 0° to –25° F. during an entire winter failed to kill the organism, which also survived for eight months in soils dried over concentrated sulphuric acid. All the evidence derived from a protracted study of *B. phytophthorus* indicated that the presence or absence of the proper conditions for infection, such as excessive soil moisture (inhibiting wound cork formation), or of some agent of inoculation, may be more influential in determining the development of the disease than the incidence of the pathogen.

SCHILBERSZKY (K.). **Die Gesamtbiologie des Kartoffel-Krebses.** [The general biology of Potato wart.]—72 pp., 1 pl., 9 figs., Freising-München, F. P. Datterer et Cie., 1930.

A comprehensive survey is given of the investigations conducted by the writer and others on the biology of the potato wart fungus (*Synchytrium endobioticum* or *Chrysophlyctis endobiotica*, the latter name being preferred) [cf. *R.A.M.*, vii, p. 738].

Far-reaching deviations from the normal, considered to justify the establishment of the fungus in a distinct genus of the Synchytriaceae, have been observed in its development (sporangial formation and zoospore fusion), as well as in the type of gall produced by it. Various other features of the life-cycle also point to the independent position of this organism and separate it from such transitional forms as *S. anomalum*. In the genus *Synchytrium* the zoospores are discharged through a short, wart-like aperture in the sporangium; this is not the case with the wart organism, in which the sporangia rupture or burst irregularly. Among the generically negative characters of the fungus should also be included the total absence of resting sori. Asexual zoospores constantly proceed from the resting sporangia. The occurrence of gamete fusion should also be considered from a systematic standpoint, since this process is unknown in *Synchytrium* [but see ibid., ix, p. 542]. The number of sporangia in the sorus of *C. endobiotica* is only 2 to 5, compared with 30 to 40 or up to 50 in *Synchytrium*.

The systematic position of *C. endobiotica* within the family Synchytriaceae is shown by means of a key, and a Latin diagnosis of the fungus is given.

Kartoffelkrebs in Schweden. Kartoffelkrebs in Norwegen. Kartoffelkrebs in Finnland. Bekämpfung des Kartoffelkrebses (Synchytrium endobioticum) in Dänemark. [Potato wart in Sweden. Potato wart in Norway. Potato wart in Finland. Control of Potato wart (*Synchytrium endobioticum*) in Denmark.]—*Nordisk Jordbrugsforskning, 1929*, 4–7, pp. 531, 536, 546, 549, 1929. (Swedish, Norwegian, and Danish.) [Abs. in *Fortschr. der Landw.*, v, 15, p. 531, 1930.]

The papers enumerated in the title, by T. Lindfors, I. Jørstad,

J. I. Liro, and O. Nielsen, respectively, describe the distribution of potato wart (*Synchytrium endobioticum*) in the Scandinavian countries, maps of certain districts being furnished [*R.A.M.*, viii, pp. 56, 152, 735, *et passim*]. In Denmark the disease appears to have been localized by drastic control measures [ibid., vii, p. 287]. The sporadic nature of infection suggests dissemination by birds, and spores of the fungus have further been found in the intestinal tracts of earthworms. The general origin of infection, however, is the use of diseased seed tubers. The control measures adopted in all four countries are described. Soil disinfection with 2 per cent. formalin is reported to have been unsatisfactory in Norway, Finland, and Denmark [cf. ibid., ix, p. 334].

GRATZ (L. O.). **Disease and climate as pertaining to the Florida and Maine Potato sections.**—*Phytopath.*, xx, 4, pp. 267–288, 3 graphs, 1930.

Detailed climatological data, consisting of daily maximal, minimal, and mean temperatures, based on ten years' observations in the Hastings (Florida) and Aroostook County (Maine) potato-growing areas, are given, together with monthly temperature and rainfall averages, and the correlation between these facts and the occurrence of various potato diseases common to both regions is discussed.

No definite relation between climatic conditions and the severity of blight (*Phytophthora infestans*) attacks can be established for either area owing to the paucity of records. A high incidence of tuber rot may be observed during certain seasons in Maine, whereas in Florida the amount of 'mahogany rot' at harvest time is almost negligible.

The slightly greater prevalence of early blight (*Alternaria solani*) in Florida may be attributed to the heavier rainfall and higher temperature towards the maturity of the plants.

Rhizoctonosis (black scurf or little potato disease: *Corticium vagum*) [*C. solani*] is more in evidence in Maine than in Florida, where the incidence of stem cankers is comparatively low. In the former State the stem lesions frequently involve the entire stem below ground level and persist throughout the season. Possibly the practice of planting the seed pieces about 6 inches deep on the level, instead of at half that depth in ridges, may be partly responsible for the heavier incidence of the disease in Maine, while the sandy, rapidly drying soil in Florida may arrest the growth of the fungus at the critical stage of infection.

Scab (*Actinomyces scabies*) is also much more important in Maine than in Florida, where the hydrogen-ion concentration of the soil (in the Hastings belt) ranges from P_H 5·4 to 5·8; these figures, though within the lower limit of tolerance for scab development (P_H 5·2), may yet exercise a certain deterrent effect.

Verticillium wilt (*V. albo-atrum*) is of very rare occurrence in Florida, but in Maine it may cause serious damage. In an experiment conducted to gain more precise information concerning this disease, some two- to three-bushel samples of tubers were selected in Maine during several consecutive seasons from hills killed by the fungus. The samples were divided into two lots, one

of which was planted in Florida and the other in Maine. Practically no wilt was observed in the Florida plantings, while in Maine the incidence of infection amounted to 25·5 and 30 per cent. in 1926 and 1927, respectively. The reasons for this discrepancy are obscure.

Blackleg (*Bacillus atrosepticus*) [*B. phytophthorus*] appears to be on the increase in the northern potato-growing States, including Maine, whereas only a slight trace of the disease has been observed in Florida during the last six years, even in fields planted with infected material from Maine.

On the other hand, bacterial wilt (*Bacterium solanacearum*) is prevalent in Florida, even on newly-cleared land, and apparently absent from Maine.

The percentage of virus diseases is about the same in the Florida potato area, where Spaulding Rose No. 4 is the only variety grown, as in the Spaulding fields of Aroostook County, Maine.

HENRY (A. W.). **Disinfection of seed Potatoes.**—*Alberta Coll. of Agric. Circ.* 7, 12 pp., 4 figs., 1930.

Popular notes are given on the control in Alberta, by standard methods of seed disinfection, of the *Rhizoctonia*, common scab, and blackleg diseases of potatoes, caused by *Corticium vagum* [*C. solani*], *Actinomyces scabies*, and *Bacillus phytophthorus*, respectively.

MURRAY (R. K. S.). **Mycologist's Report for 1929.**—*Eighth Rept. Exec. Ctte. Rubber Res. Scheme (Ceylon). Proc. during the year 1929*, pp. 31–34, 1930.

In this report, compiled on the same lines as in previous years [*R.A.M.*, viii, p. 599], the author gives notes on the diseases of *Hevea* rubber studied by him in Ceylon in 1929. Most of the information has been noticed in this *Review* from other sources.

MITCHELL (J.). **Organizing Secretary's Report on visits to estates.**—*Eighth Rept. Exec. Ctte. Rubber Res. Scheme (Ceylon). Proc. during the year 1929*, pp. 14–16, 1930.

In this report, compiled on the same lines as in previous years [*R.A.M.*, viii, p. 598], notes are given on the principal diseases of *Hevea* rubber observed in Ceylon in 1929. Good progress has been attained in the control of *Fomes lignosus*, which is being gradually eradicated by the treatment now practised on the majority of estates. Further observations confirmed the efficacy of the method, consisting in cutting out the lesions caused by *Ustulina zonata* and filling in the cavities with concrete [loc. cit.] for the treatment of collar rot due to this organism; a more general adoption of this method is strongly advised. *Sphaerostilbe repens* was again reported from flooded areas, but caused few deaths among the trees. The early part of July was marked by an outbreak of secondary leaf fall (*Phytophthora* sp.), but the disease was soon checked by the setting in of dry weather conditions.

MURRAY (R. K. S.). **The control of bark rot.**—*Rubber Res. Scheme (Ceylon) Leaflet* 12, 4 pp., 1930.

This leaflet calls attention to the necessity of taking careful

control measures for the prevention of outbreaks of bark rot or black stripe [*Phytophthora* spp.: *R.A.M.*, viii, p. 674] of *Hevea* rubber in Ceylon, when tapping is resumed during the wet monsoon weather in June, after the cessation which is to be effected in May, 1930. For this purpose it is recommended that during the whole of June and July the tapping cuts should be protected with a coating of the waterproofing cargillineum mixture [ibid., viii, p. 599], where feasible at intervals of 10 or 14 days; during wet periods this treatment should be supplemented with applications, after each cut, of a 5 per cent. dilution of brunolinum plantarium in water, for the purpose of ensuring the protection of the surface between the successive applications of the first mixture; it is emphasized that in wet weather it would be better to omit the waterproof mixture rather than the disinfectant.

MURRAY (R. K. S.). **A disease of young bud-shoots caused by Phytophthora palmivora Butler.**—*First Quart. Circ. for 1930, Rubber Res. Scheme (Ceylon)*, vii, 1, pp. 10–12, 1 pl. 1930.

This is a somewhat expanded account of the disease of young shoots of bud-grafted *Hevea* rubber briefly described in a preliminary report [*R.A.M.*, ix, p. 200], the causal organism of which has been identified as a strain of the rubber group of *Phytophthora palmivora* [ibid., viii, p. 674]. So far, the disease is not of much economic importance in Ceylon, but a careful watch should be kept on the young bud-shoots of valuable material during wet weather, and any diseased shoots should be cut off well below the affected part and burnt; neighbouring healthy shoots should be periodically sprayed with Bordeaux mixture.

[This paper is also printed in the *Tropical Agriculturist*, lxxiv, 4, pp. 216–218, 1930.]

s'JACOB (J. C.). **Onderzoekingen over de beschadiging van het Heveablad door Oidium heveae.** [Investigations on the injury to the *Hevea* leaf by *Oidium heveae*.]—*Arch. Rubbercult. Nederl.-Indië*, xiv, 4, pp. 171–185, 10 figs., 1930. [English summary.]

In a microscopic study of the *Hevea* rubber mildew (*Oidium heveae*) [*R.A.M.*, ix, p. 485], the author found that germination of the conidia occurs in a humid atmosphere without direct contact with free water. Later, a lobed appressorium is formed on the germ-tube and the fungus penetrates the epidermal cells by means of piriform haustoria. There is no penetration of haustoria into the subepidermal cells nor does the mycelium enter the leaf tissues through the stomata, so that it belongs neither to *Uncinula* nor *Phyllactinia*.

Following penetration by the haustoria the affected cells soon die off, the protoplasm turning brown. The subepidermal cells usually perish also, although they are not invaded by the parasite, their chloroplasts turning yellow. Infected leaves always show a typical reaction, the cells of the tissue below the diseased parts forming periclinal walls, followed some time later by the development of a cork cambium. This cork formation does not serve the purpose of preventing the further penetration of the fungus, as the

latter is never found below the epidermis, but it prevents the access of nutrition from the deeper layers and so may lead to the death of the mycelium.

The fungus does not affect the petiole tissues or vascular bundles in such a way as directly to induce leaf fall, which may, however, be a reaction to the increased evaporation caused by the death of the epidermis on the infected parts.

The formation of food reserves decreases owing to the damage inflicted on the chloroplasts as well as on account of the defoliation. The renewed formation of leaves after an attack still further exhausts the food supply, which can only be replenished slowly. A die-back of the twigs and branches may, therefore, ensue. The deformation of the leaves begins by the death of a patch of epidermal cells, causing an uneven growth of the leaf tissues.

Maas (J. G. J. A.). **Meeldauwbestrijdingsproeven bij's Lands Caoutchoucbedrijf in 1929.** [Mildew control experiments on the Government Rubber estate in 1929.]—*De Bergcultures*, iv, 15, pp. 386–394, 1930.

The writer gives in considerable detail the results of the experiments in the control of rubber mildew [*Oidium heveae*] in Java conducted under official auspices during 1929 [*R.A.M.*, ix, p. 485]. In addition to points already noticed the following are of interest. Complete control of the disease was given by dusting with sulphur (18 to 20 kg. per hect. at a time), applied in some cases four times at three-weekly intervals and in others six times at fortnightly intervals. The incidence of infection in the untreated control plots was up to 90 per cent. It is believed that four dustings, 10 to 15 kg. sulphur per hect. at each, should suffice, when the most economical methods of application are worked out. Generally speaking, the treatment need not be commenced before July or continued longer than about two months. It is estimated that 8 hect. can be treated per hour by the Sulzer apparatus, the distance through which the dusting machine travels during the operation being 100 m. per hect., and the amount of sulphur used 15 to 20 kg. per hect. The total cost of the treatment per hect., calculated on a basis of 40 kg. of sulphur per hect. in all and including transport, labour, maintenance of apparatus, repairs, and depreciation, is Fl. 5·30, the corresponding figure for 60 kg. being Fl. 7·30. These figures are calculated for a favourably situated estate and a small apparatus, and must of course be proportionately increased where conditions are less propitious and a larger machine is employed. The total cost only amounts to 1 to 1½ cents. per kg. of dry rubber, and it may be confidently anticipated that it will fall still further with improved methods of treatment and a consequent decline in the incidence of infection.

In conclusion some details are given concerning the methods of analysing sulphur for fineness, with the results of tests carried out at the Tea Experiment Station. It is important that the moisture content of the sulphur should not exceed 1·5 per cent., and the admixture of 10 per cent. lime is recommended as an aid to drying. Sulphur sludge has not given satisfactory results in the experiments under the writer's supervision.

Wormser (G.) & Barat (H.). **Une maladie de l'Hevea en Cochinchine. (Note préliminaire).** [A disease of *Hevea* in Cochin China. (Preliminary note).]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 2, pp. 15–20, 2 pl. (1 col.), 1 fig., 1930.

In 1929 the authors observed a die-back of one- to three-years old *Hevea brasiliensis* trees in Cochin China, characterized by the development, in apparently healthy parts of the stem, of very numerous, hypertrophied, oval, elongated lenticels up to 3 mm. long and divided medially like a coffee bean. Cracked, corky patches exuding latex or sap were also noted on a level with the petioles, on which the lenticels were also occasionally hypertrophied. The disease appeared in August, in the middle of the wet season, reached its maximum in September, and was completely arrested with the advent of the dry season; a few cases were seen, however, in May. The first cases were sporadic, but these served as foci of further infections.

The swollen lenticels appeared first at the top of the stem. This stage was often prolonged, and was followed by the formation of a brown area 30 to 60 cm. below the apex, which spread rapidly downwards and more slowly upwards, the affected parts becoming marbled with green and brown patches. The brown discoloration extended inwards as far as the pith. The terminal shoot gradually dried up, blackened, was attacked by various fungi (probably saprophytic), and turned light grey. As these symptoms appeared, the base of the petioles darkened, and the leaves were shed, though the petioles remained attached for some time. In very severe cases the tree succumbed, but this was relatively rare, the disease usually being arrested at one or other of the earlier stages according to the weather.

In the bark and vessels of the discoloured and dead areas a mycelium was found, penetration having taken place along the medullary rays. In the parts showing the marbled appearance the mycelium had not progressed beyond the phloem, while in the apparently healthy, green, or suberized areas it was found only in the bark, its constant presence near the lenticels being diagnostic. The latter appeared to have become hypertrophied as a result of the presence of the mycelium in the immediate vicinity of the cork cambium.

At first only fructifications of a *Macrophoma* type were found, but further examination showed in all cases a *Gloeosporium* and *Botryodiplodia theobromae*. The *Macrophoma* was ascertained to be an arrested stage in the development of *B. theobromae*, with hyaline spores forming a white mass at the ostiole of the pycnidia and capable of germinating without septation.

Taylor (R. A.). **Physiological Botanist's Report for 1929.**—*Eighth Rept. Exec. Ctte. Rubber Res. Scheme (Ceylon). Proc. during the year 1929*, pp. 23–30, 1930.

In this report the author states that comparative tests on approximately 200 *Hevea* rubber trees on the Gikiyanakande Estate in Ceylon showed that the isolation method without scraping [*R.A.M.*, viii, p. 808] is not suitable for the treatment of the brown bast disease in cases where an area of bark of more

than a few inches in diameter is affected. The isolation of large sections of bark, while stopping spread, does little to effect a cure, and the final results on small areas are comparable with those of the usual method.

PISTOR (R.). **Beiträge zur Kenntnis der biologischen Tätigkeit von Pilzen in Waldböden.** [Contributions to the knowledge of the biological activity of fungi in forest soils.]—*Zentralbl. für Bakt.*, Ab. 2, lxxx, 8–14, pp. 169–200; 15–22, pp. 378–410, 2 diags., 1930.

A comprehensive account, accompanied by numerous tables, is given of the writer's investigations on the biological activity of fungi in forest soils in the Hannover-Münden district of Germany [cf. *R.A.M.*, ix, p. 201].

Samples of humus for examination were obtained by Jensen's method (*Cornell Agric. Exper. Stat. Bull.* 315, 1912), with slight modifications, minute quantities of the soil being transferred with a platinum needle to plates containing an agar medium. The following fungi were isolated: *Mucor flavus* [*R.A.M.*, ix, p. 201], *M. ramannianus*, *Penicillium commune*, *Actinomyces* sp., *Mortierella* sp. [ibid., viii, p. 129; ix, p. 201], *Mucor plumbeus* [ibid., vii, p. 268], *M. racemosus* [ibid., viii, p. 785], *M. hiemalis* [ibid., ix, p. 201], *Mortierella polycephala*, *Mucor subtilissimus*, and two unidentified forms from the soil of pine woods; *M. hygrophilus*, *Mortierella* sp. (? *Thamnidium*), *Torula*, *Acaulium nigrum*, and a sclerotium-forming *Penicillium* from beech forests.

Beech humus was most actively decomposed by the last-named fungus and *P. commune*, and pine humus by *Actinomyces*, *Mucor plumbeus*, one of the unidentified fungi, and *Torula* sp. *M. flavus* and *Acaulium nigrum* destroyed pine needles most rapidly; beech leaves were little affected by any of the organisms.

Practically all the fungi examined were able to withstand a high degree of acidity in the culture medium, but the optimum hydrogen-ion concentration for growth was found to lie between P_H 6 and 8.

Details are given of a new method of soil and humus sterilization which obviates the changes in the organic substance involved in the previous method of steam sterilization.

BROWN (P. E.) & SMITH (F. B.). **Phosphorus assimilation by certain soil molds.**—*Iowa State Coll. Journ. of Sci.*, iv, 3, pp. 325–330, 1930.

Cultures of 16 species of moulds [which are enumerated] in liquid media and in soil were incubated for 45, 60, or 71 days. With two exceptions the organisms [which were identical with those isolated by Abbott: *R.A.M.*, vii, p. 57] showed a definite capacity for the assimilation of phosphorus. *Tetracoccosporium paxianum* in liquid culture gave an increase in water-soluble phosphorus, all the others showing a decrease or a phosphate assimilation. *Penicillium vinaceum* had no power of assimilating phosphorus in the soil culture test.

The capacity for the assimilation of soluble phosphorus appears to be a common feature of soil moulds. No definite correlation

could be detected between assimilatory capacity and change of reaction in culture solutions.

Newton (W.) & Yarwood (C.). **The downy mildew of the Hop in British Columbia.**—*Scient. Agric.*, x, 8, pp. 508–512, 1920.

In 1929 it was found that the spike-like growths associated with downy mildew of the hop (*Pseudoperonospora humuli*) [*R.A.M.*, ix, pp. 486, 487] fell into two more or less distinct types in British Columbia, the first occurring chiefly as 'basal spikes' among the normal young green bines developing from the crown in April, while later in the season similar spikes were observed in the form of lateral and terminal growths.

The common nettle of British Columbia, *Urtica lyalli*, appears to be immune from downy mildew, as also is the Fuggles variety of hop; Kent Goldings are somewhat resistant, and Early and Late Clusters very susceptible.

No reduction of basal spikes was effected by dusting the crowns with a 1 in 8 mixture of anhydrous copper sulphate shortly after the beginning of growth.

Varga (F.). **A Paprika tracheomykosisa.** [Tracheomycosis of Paprika (*Capsicum annuum*).]—*Bot. Közlemények*, xxvi, 5–6, pp. 81–88, 2 figs., 1929. [Hungarian, with German summary.]

A detailed description is given of a wilt disease of chilli pepper (*Capsicum annuum*) observed in the market-gardens of Hatvan and Aszód (Hungary) during the autumn of 1923, and found to be due to two fungi, viz., *Fusarium moniliforme* [*Gibberella moniliformis*] (not previously recorded on this host) and *Verticillium albo-atrum* [*R.A.M.*, ii, p. 150]. Pure cultures of both fungi were grown on various nutrient media and inoculated into wounded and unwounded *C. annuum* plants. Positive results were obtained only in the case of *G. moniliformis* (the germination and development of the macroconidia of which are described), but the author considers that *V. albo-atrum* also plays a part in the causation of the wilt. Control measure are indicated [in Hungarian only].

Wilbrink (Miss G.). **Mechanical transmission of Sugar-Cane mosaic.**—*Proc. Third Congress Internat. Soc. Sugar Cane Technologists*, pp. 155–165, 1 plan, 1930.

In tests made in Java to ascertain whether sugar-cane mosaic is transmissible by mechanical means, 30 healthy stools of E.K. 28 growing in 10 tubs were cut down when about 3 months old, a sterile knife being used on the canes in half the tubs and one contaminated with mosaic on the remainder. The tubs were then kept in an isolated place in the open. Later, the stools in two of the tubs containing canes cut with the infected knife showed, respectively, 10 and 12 diseased sprouts, the stools in the other tubs remaining healthy.

In a further experiment, in which the more susceptible D.I. 52 canes were used, five adjacent rows each containing 10 healthy stools of six-months-old plants were cut down, the cut canes being used as seed pieces; a sterile knife was used in three of the rows

(which were cut down first), and a contaminated knife on the two remaining rows. Adjacent plots were then planted with the seed pieces, each with the cutting of one row. About 15 per cent. of the plants in the plots sown with seed-pieces cut with the infected knife showed infection, none of the others becoming diseased during the three months following planting. Under the conditions of the experiment the chances of insect transmission playing any part in infection were considered to be slight.

In a third test, 15 sets of healthy E.K. 28 cane were cut with a sterile knife and planted in an insect-proof cage, 15 sets of the same origin, but cut with a contaminated knife, being similarly planted. In each cage 13 sets produced stools, and three months later 5 stools from the canes cut with the contaminated knife showed mosaic, though all the controls remained healthy. This result is considered to afford definite proof that mechanical transmission of sugar-cane mosaic can take place on the cutting knife.

Seín (F.). **A new mechanical method for artificially transmitting Sugar-Cane mosaic.**—*Journ. Dept. Agric. Porto Rico*, xiv, 2, pp. 49–68, 1930.

A new mechanical method for the artificial transmission of sugar-cane mosaic [see preceding abstract] by pricking with contaminated insect pins has been devised and used at the Porto Rico Insular Experiment Station from 1924 to 1929. The method is stated to combine simplicity with a high degree of efficiency.

Contrary to the general opinion, the expanded leaves of mosaic sugar-cane plants form as good a source of inoculum as the more tender ones. Black No. 0 and white No. 2 Asta insect pins have been used. Possibly a finer pin than black No. 0 would produce higher percentages of infection and necessitate a smaller number of pin-pricks at each inoculation, but for ordinary routine work the above-mentioned proved very satisfactory. One pin was generally used repeatedly for inoculation, but many pricks may be made at once by tying several pins together [cf. *R.A.M.*, vii, p. 477]. The inoculation of sugar-cane plants 2 ft. and more in height is carried out as follows. The expanded leaves are bent down to expose the central spindle. The outermost leaf, the basal part of which is still tightly wrapped round the spindle, is stripped off, exposing the whitish cylinder of tender leaves. A slip about one inch wide and eight long is stripped from a mosaic leaf, placed like a band round the base of the exposed spindle, and held tightly in position. The pin is thrust rapidly in and out through different parts of the mosaic band into the healthy spindle.

On 24th August, 1928, 100 shoots, each in a different plant of S.C. 12(4) cane, were inoculated by the leaf-slip method and tagged. Between 8th and 15th September, 94 of these shoots developed mosaic, no other case of secondary infection by which was detected in the field before the latter date.

Tongaat group members visit the Experiment Station.—*South African Sugar Journ.*, xiv, 4, pp. 265, 267, 269, 1930.

Replying to inquiries by a member of the Tongaat Sugar Com-

pany at a recent visit of the group to the Experiment Station [Mount Edgecombe, Natal], the Director (Mr. H. H. Dodds) stated that a difference in yield of some 10 per cent. had been found between streak-diseased and healthy canes at planting time [*R.A.M.*, ix, p. 203]. The P.O.J. 2714 and 2725 varieties had been planted in the most heavily streak-infected locality that could be found without contracting the disease.

BOLLE (P[IERRETTE] C.). **Different forms of top rot.**—*Proc. Third Congress Internat. Soc. Sugar Cane Technologists*, pp. 146–155, 1930.

The form of top rot of sugar-cane caused in Java by lightning injury is readily recognizable by the presence of torn leaves, the outer ones often being green when the inner ones are dead. On the surface of the stem, which is often much shrunken, sunken patches resembling burns may be present, while the buds and dormant roots have grown out. When the cane is cut longitudinally, the growing point and young internodes are often found to have rotted away, while the interior of the leaf spindle may also be totally disorganized. The older internodes are frequently hollow, and the inner tissue is brownish, characteristic protrusions penetrating the cavities. The lower internodes, if fully grown, also show a cavity bordered by dead tissue set off by a red line against the living tissue at the periphery of the stem; this line curves in at the nodes, most of which consist of living tissue.

When the cane succumbs directly to the top rot caused by red stripe (*Phytomonas rubrilineans*) [*R.A.M.*, ix, p. 406] the interior of the central spindle is decayed to a weak, offensively smelling mass, white in the leaf spindle, purplish-pink in the growing point and the upper internodes; lower down, where the amount of decay is less, the diseased tissue is yellow, then white, finally becoming a brownish, water soaked streak. The lesion is always broader at the internodes than at the nodes, and is always bordered by a dark red line. The soft tissues consist of loosened and broken cells intermingled with masses of bacteria. The solid tissue is also crowded with bacteria occupying the cells of the pith and in the xylem vessels. The vessels may contain reddish or yellow gum, but more often only the walls are discoloured by this exudation, which frequently also fills the intercellular spaces. The red boundary line consists of discoloured pith cells filled with bacteria, while the vascular bundles of this area are not discoloured, but contain bacteria. Outside the red line, in the apparently healthy tissues, masses of bacteria are present even in the vascular bundles.

The symptoms of pokkah boeng are also recapitulated [ibid., vii, p. 537; ix, p. 341], this form of top rot being differentiated from the other two forms described above.

NORTH (D. S.). **The bacterial-vascular diseases of Sugar Cane.**—*Proc. Third Congress Internat. Soc. Sugar Cane Technologists*, pp. 142–146, 1930.

This is the full paper on gummosis (*Bacterium vascularum*) and leaf scald (*Bact. albilineans*) of sugar-cane in Australia, a summary

of which, giving the essential points, has already been noticed [*R.A.M.*, ix, p. 203].

[This paper is reprinted in *Australian Sugar Journ.*, xxi, 10, pp. 614–616, 1930.]

ILLINGWORTH (J. L.). **Notes on gumming disease of Sugar-cane.** —Pamphlet issued by *Leeward Islands Dept. of Agric.*, 12 pp., 1930.

During the period from February to October, 1929, the writer conducted an investigation on gumming disease of sugar-cane (*Bacterium vascularum*) [see preceding abstract] in Antigua, the work during the first three months being carried out jointly with F. H. S. Warneford.

The symptoms, effects, and mode of dissemination of the disease are briefly described. The crown varieties grown in Antigua may be divided into four groups on the basis of reaction to gumming disease, viz., highly resistant, including B.H. 10 (12), B. 4507, B. 6308, B. 4596, S.C. 12(4), B. 147, and B. 417; semi-resistant (Ba. 6032, Hill Seedling, and White Transparent); susceptible (Ba. 11,569); and very susceptible (Bourbon) [cf. ibid., viii, pp. 464, 465].

A curious distribution of the stem symptoms was shown by canes of the Ba. 11,569 variety, the maximum incidence of infection occurring three-quarters of the way down, with the minimum at the top and a gradual decline below the maximum towards the base. This phenomenon is tentatively attributed to the effects of the hurricane on 12th September, 1928, when the high winds and driving rain conveyed the causal organism to the region of insertion of the leaves, which at that time would have been those that ultimately were three-quarters of the way down the fully-grown stem. In this variety the plant cane and first ratoons showed practically equal stem infection (which took a very mild form), while a considerably lower incidence was exhibited by the second ratoons; this was not, however, accompanied by a corresponding diminution in the leaf symptoms. Following the dry weather from February to April, the canes were almost free from conspicuous foliage infection by the end of the latter month and no lesions were found in July. During August, September, and the first half of October, there was a general development of leaf symptoms, which were succeeded, in some first ratoon fields, by gumming. In one field, however, where the leaf infection was very heavy, there was no development of gumming. An examination of six second ratoon fields for stem symptoms in September and early October yielded completely negative results. In three fields of young plant cane of Ba. 11,569 the development of leaf symptoms followed the same course as in ratoons, the general incidence being delayed until the stage of growth was reached, when leaf contacts became numerous, i. e., about the middle of August.

Experiments to determine the effect of natural infection by *Bact. vascularum* on Ba. 11,569 cuttings showed that the growth rate of diseased cuttings was decidedly lower than that of healthy ones.

Summarizing the results of his studies in Antigua, the writer points out that stem gumming has by no means reached its culmi-

nating point, and no definite recommendations for its control are feasible at the present juncture.

MARTIN (J. P.). **Pathology.**—*Proc. Hawaiian Sugar Planters' Assoc., Forty-ninth Ann. Meeting, 1929,* pp. 99–109, 1930.

Further investigations on Lahaina root rot of sugar-cane supported the view that susceptibility to the disease is a function of nutrition [see next abstract]. Stimulative nitrogenous materials, added to soil where Lahaina had previously grown without root rot, creates an environment in which the disease becomes serious. Such materials include stable manure, nitrates, cane compost, and molash cake [*R.A.M.*, viii, p. 739]; the constituents of the last-named responsible for stimulated root growth and consequent *Pythium* infection were found to be the molasses and press cake, bagasse inducing a depressed type of growth and no root-rot. A more or less severe progressive rot of the new roots, believed to be due to *Pythium* spp., was observed to be an almost constant feature of the Lahaina disease. This type of rot is very transient, the susceptible root material apparently being exhausted in a few days. Throughout the period of the observations, however, the dominant condition of the susceptible canes was a depleted root system with severe rotting of the new roots. The decay was typical of *Pythium*, being characterized by a red to yellow, flaccid rotting of the roots when three to five inches long. Histological studies indicate that *P. aphanidermatum* gains entrance to the roots through the rapidly growing cells just behind the root tip. The fungus may enter a root and reach the centre in four hours, penetration being apparently by pressure.

Plantation inspections have shown that the incidence of mosaic is gradually declining, due partly to the cultivation of resistant cane varieties, such as D. 1135. The Java P.O.J. 36 variety, which is highly resistant to mosaic, eye spot [*Helminthosporium ocellum*: ibid., ix, p. 132], and other local diseases, is rapidly gaining a commercial position in certain localities.

Certain sugar-cane varieties cultivated in Hawaii are very susceptible to pokkah-boeng (*Fusarium* spp.) [ibid., ix, p. 341]. Inoculation experiments with several strains of these organisms isolated from diseased canes gave positive results, thereby corroborating the outcome of similar tests by D. S. North in Australia.

CARPENTER (C. W.). **Pythium root rot in Hawaii.**—*Proc. Third Congress Internat. Soc. Sugar Cane Technologists*, pp. 131–135, 1929.

In this brief note the author gives some details of experiments which tend to confirm his view that the Lahaina sugar-cane is predisposed to attacks of root rot (*Pythium aphanidermatum*) by an excess of nitrogenous nutrients and products of cane trash decomposition in the soil [see preceding abstract].

FLOR (H. H.). **Relation of environmental factors to growth and pathogenicity of Pythium isolated from roots of Sugar-Cane.** —*Phytopath.*, xx, 4, pp. 319–328, 2 figs., 1930.

An account is given of some recent studies conducted at the

Louisiana Agricultural Experiment Station to determine the influence of moisture, temperature, and hydrogen-ion concentration on the growth of various strains of *Pythium* (isolated from sugar-cane) in culture and on the development of *Pythium* root rot of maize [*R.A.M.*, viii, p. 740].

The rate of growth of four parasitic strains isolated from cane roots in Louisiana increased with the temperature up to 30° C. and fell off rapidly at 36°. Similar, though less marked, results were obtained with several mildly parasitic forms, also isolated from sugar-cane.

A neutral or slightly alkaline medium was found to be the most favourable for the growth of *Pythium*. No development occurred in solutions (20 gm. dextrose, 3 gm. beef extract, and 5 gm. peptone, made up to 1,000 c.c. with distilled water) of initial P_H 4·3 or 4·6. Growth was retarded at first in flasks with an initial reaction of P_H 5·3, but by the end of three weeks it was as profuse as in those with a more favourable hydrogen-ion concentration. The best growth was obtained in the solution having an initial hydrogen-ion concentration of P_H 8·3, though development in the original solution without the addition of acid or alkali was only a little slower. Practically no growth took place above P_H 9·6. The metabolic products of fungous growth changed the P_H of the media towards 6, regardless of the initial hydrogen-ion concentration. After the attainment of maximum growth the solutions uniformly became alkaline.

Calhoun Red Cob maize seedlings were grown at controlled temperatures in metal cans filled with sterilized soil inoculated with pure cultures of two parasitic strains of *Pythium*. Both strains were most virulent at the intermediate and lower temperatures. A temperature of 35° was too high for the best growth of the maize, but little rotting occurred at this point. At 30° the maize developed most satisfactorily, but considerable decay took place, while at 15° the injury from *Pythium* was extremely severe, even the main roots being rotted off nearly to the seed. Another form of damage observed at low temperatures (15° and 20°) was a rotting of the mesocotyl and stem above the seed. The reduction of growth due to *Pythium* was shown to be most marked during cooler weather and in wetter soils. In soils maintained at 20 and 30 per cent. of their water-holding capacity there was little *Pythium* injury, though the maize failed to make good growth under such dry conditions. The germination of the seedlings was not materially affected by inoculation with *Pythium* in soil kept at 30 or 40 per cent. of its water-holding capacity. During the cool months of March and April there was an appreciable reduction of germination at 50 per cent. in the infested soil; in the May series of tests these effects were evident at 60 per cent., while in June the *Pythium*-infested soil at 80 per cent. of the water-holding capacity was the first to show a significant decrease in germination.

Bourne (B. A.). **The occurrence of the ring-spot disease of Sugar-Cane in Florida.**—*Phytopath.*, xx, 4, pp. 364–365, 1930.

Some typical cases of ring spot of sugar-cane (*Leptosphaeria*

sacchari) [*R.A.M.*, vii, p. 401] were observed in 1929 at three localities in Florida, the diseased varieties including D. 109, D. 117, Co. 281, C.P.H. 139, Cristalina, and several seedlings bred at the Sugar Experiment Station, Canal Point. Apparently only the regions most severely swept by the central vortex of the hurricane of September, 1928, are infested, indicating that the fungus was carried from Porto Rico, where the disease is widespread [ibid., vi, p. 601].

Java's new Cane quarantine station. Establishment for handling imported Cane cuttings at Ranoe Daroengan a new development.—*Facts about Sugar*, xxv, 15, p. 353, 2 figs., 1930.

A quarantine station for imported sugar-cane cuttings has recently been established at Ranoe Daroengan by the Java Sugar Experiment Station [*R.A.M.*, ix, p. 61]. Hitherto the Java sugar industry has imported few or no foreign varieties, but the acquisition of a large number of New Guinea specimens and the plan of testing extensive crossings of native canes with foreign varieties have rendered a quarantine station indispensable. The tract selected for the station is situated in the midst of a primeval forest, near a small mountain lake and about 20 km. distant from any extensive native cane plantations. The land is divided into two separate fields, one for the reception of new acquisitions and the other to be held in reserve in case signs of disease are detected. At the end of 1929 there were 134 planting-holes with imported canes, including the following: Brazil seedlings C.B. 2433 and 3100; Tucumán 407 and others from the Argentine; a few aboriginal canes from the Philippines; and a few 'glagahs' (*Saccharum spontaneum*) from the Philippines, Sumatra, and Burma. Larger consignments are expected in the near future from New Guinea, the Philippines, India, Africa, and Central America. The 'noble' varieties 10(12) and 12(4) are to be tested as to their value for crossing purposes. Some Java commercial varieties, e.g., P.O.J. 2878, E.K. 28, and D.I. 52, are also being planted with a view to bringing into evidence any traces of disease of which the imported varieties may act as carriers while themselves showing no symptoms.

Sugar-Cane quarantine. (A report by the Sugar-Cane Quarantine Committee.)—*Proc. Hawaiian Sugar Planter's Assoc., Forty-ninth Ann. Meeting, 1929*, pp. 110–113, 1930.

As a result of careful consideration, the Hawaiian sugar-cane quarantine operations have been transferred from Honolulu to the island of Molokai, where they are far removed from any commercial plantings. Two quarantine houses have been erected on a plot at Kanoa, No. 2 being much larger than No. 1 and of an entirely new design. The quarantine of imported canes have been divided into three growth periods, of which the first is passed in house No. 1, where the cuttings are planted in pots or tubs and the resulting stools grown for three months or more. If no foreign pest or disease appears on the stools during this period, cuttings only are transferred from house No. 1 to No. 2, where they are planted in the large pit-bed together with cuttings of several

standard local varieties. Here they are grown for nine months or more, after which cuttings taken from them are planted out in the quarantine field at Kawela, where they are cultivated for a year or more in close contact with standard varieties before being shipped to the other islands.

Sydow (H.). **Fungi venezuelani.** [Venezuelan fungi.]—*Ann. Mycol.*, xxviii, 1–2, pp. 29–224, 1930.

Towards the end of 1927 the author spent about two months in Venezuela, the mycological flora of which was practically unexplored. The present paper represents very extensive collections of fungi containing several new genera and many new species, chiefly of the rusts, Ascomycetes, and Fungi Imperfecti, and including many parasitic forms.

Hopkins (J. C. F.). **A list of plant diseases occurring in Southern Rhodesia.**—*Rhodesia Agric. Journ.*, xxvii, 4, pp. 413–418; 5, pp. 523–529; 6, pp. 647–652, 1930.

In accordance with recommendations made at the Imperial Agricultural Conference, 1927, the author has completed a list of the plant diseases found in Southern Rhodesia, based on Eyles's preliminary list published in 1926 [*R.A.M.*, v, p. 716], numerous additions, however, having been made and many specific and generic names revised. As the list is not intended as a plant disease survey, the localities from which the diseases were reported are not given.

Narasimhan (M. J.). **Studies in the genus Phytophthora in Mysore. I. Heterothallic strains of Phytophthora.**—*Phytopath.*, xx, 3, pp. 201–214, 5 figs., 1930.

In addition to *Phytophthora arecae* [*R.A.M.*, vii, p. 602] on *Areca catechu*, seven strains of *Phytophthora* [which are briefly described] were collected in Mysore on *Santalum album*, *Loranthus longiflorus*, *Jatropha curcas* (which answered to the description of *P. jatrophae* Jens.), *Bryophyllum calycinum*, *Artocarpus integrifolia*, *Colocasia antiquorum* (probably *P. colocasiae*), and *Ficus hispida*. Monospore cultures of four of these strains, viz., *P. arecae* and those on *Santalum*, *Loranthus*, and *Jatropha*, were obtained and grown in paired cultures.

When monospore cultures of the *Areca* or *Loranthus* strains were grown with either of the strains from *Santalum* or *Jatropha*, oospores measuring 30 to 31 μ were formed at the juncture of the two mycelia, the area being indicated by the development of a brown line. Neither oospores nor the brown line were produced when the *Areca* and *Loranthus* strains, or those of *Santalum* and *Jatropha*, were grown together. When the *Areca* and *Santalum* strains were paired, the antheridia were traced microscopically to the mycelium of the former, and the oogonia to that of the latter strain. Oospore formation, therefore, is held to result from the fusion of heterothallic strains, those of *Areca* and *Loranthus* having the male mycelia and those of *Santalum* and *Jatropha* the female.

Cultures of *P. parasitica* and *P. meadii*, which had lost their capacity for oospore formation, readily produced these bodies when grown with a male strain (*P. arecae*), but not with a female one, e. g., that on *Santalum*. The oospores resulting from this union measured 24 to 25 μ, and were thus intermediate in size between those of *P. parasitica* and *P. arecae*. The absence of oospores in certain species of *Phytophthora* is tentatively attributed to the isolation of the two sexual strains on different host plants rather than to the influence of external conditions.

Tamiya (H.) & Morita (S.). **Bibliographie von Aspergillus. 1729 bis 1928. Fortsetzungen XIV, XV, und XVI.** [Bibliography of *Aspergillus*. 1729 to 1928. Continuations XIV, XV, and XVI.]—*Bot. Mag.*, Tokyo, xliv, 520, pp. 209–218; 521, pp. 251–261; 522, pp. 306–316, 1930.

The first of these continuations comprises the titles of 122 papers relating to *Aspergillus* published during 1927, while the second contains 135 titles of works appearing in 1928 [*R.A.M.*, ix, p. 561]. The third enumerates 129 additional papers on the subject which were omitted from previous lists.

Dippenaar (B. J.). **'n Bydrae tot ons kennis van die Suid-Afrikaanse geslagte en soorte van die famielie Polystomellaceae.** [A contribution to our knowledge of the South African genera and species of the family Polystomellaceae.] —*Ann. Universiteit van Stellenbosch*, viii, A, 2, 35 pp., 3 pl., 1930.

This contribution to the taxonomy of the South African Polystomellaceae contains notes on species of 16 genera, including a new genus, *Byliana* Dippenaar, represented by *B. halleriae* n. sp. on the leaves of *Halleria lucida*. Latin diagnoses of the genus and species are given. A list of hosts is appended.

Hiratsuka (N.). **Pucciniastrum of Japan. (Notes on the Melampsoraceae of Japan III.)**—*Bot. Mag.*, Tokyo, xliv, 521, pp. 261–284, 1930.

Historical, geographical, and taxonomic notes are given on the 19 species of *Pucciniastrum* (out of a total of 23 known to science) occurring in Japan [cf. *R.A.M.*, vii, p. 405], of which *P. fagi* Yamada, on leaves of *Fagus sieboldi*, is stated to be new. Tables are given showing the distribution of the species of *Pucciniastrum* in Japan and of the Japanese species in the world, and fungus and host indices are appended.

Haigh (J. C.). **Macrophomina phaseoli (Maubl.) Ashby and Rhizoctonia bataticola (Taub.) Butler.**—*Ann. Roy. Bot. Gard., Peradeniya*, xi, 3, pp. 213–249, 7 pl., 4 figs., 1930.

Twenty-seven strains of *Macrophomina phaseoli* (*Rhizoctonia bataticola*) have been divided by the author into three groups, according to their mean sclerotial diameter in culture. The first, or C, group contains those strains having a mean sclerotial diameter

of 120 μ or less, the middle, or B, group those with one of about 200 μ, while the A group comprises those whose sclerotia are conveniently measured in millimetres. Sclerotia belonging to any of these groups may be isolated from trees and woody plants generally (all three were obtained from rubber and coco-nut), but herbaceous plants as a rule give only sclerotia of group C, and pycnidia of *M. phaseoli* were obtained only from these hosts. Much variation was shown by the C group, but the differences were so diverse that they could not be correlated. The pycnidia of *M. phaseoli* were found to be connected with five strains of group C, and it is considered possible that the other groups may have distinct higher stages.

The observations made on the development of the sclerotium indicated that it is essentially the same in all three groups, though there appeared to be some tendency in the A and B forms for more than one hypha to take part. Sections of sclerotia from the three groups [which are figured] show that in all cases there is differentiation into a thin cortex and a medulla.

Pycnidia were obtained in cultures of a C strain from pigeon pea (*Cajanus indicus*) grown on sterilized pigeon pea stems in Roux tubes. The pycnospores were typical of *M. phaseoli*, measuring 16 to 27 by 5 to 11 μ and averaging 24 by 8 μ, though some pycnidia were found in which the spores were shorter and broader than normal. Cultured on maize meal agar, the pycnospores produced a growth in which both pycnidia and sclerotia were present. Three of the pycnospore cultures were put back on to *Cajanus* twigs, whereupon two produced sclerotia only, while the third produced a distinctive growth with scanty white mycelium, no sclerotia, and abundant black, solitary, shining pycnidia with many spores, which in culture gave pycnidia only, whereas pycnospores from the twigs inoculated with the other two cultures produced a sclerotial form similar to that used for the original inoculations. It thus became apparent that there had arisen by saltation strains of *M. phaseoli* which in culture produced pycnidia and sclerotia, or either separately [cf. *R.A.M.*, vii, p. 540]. This form causes a charcoal rot of sweet potato tubers with the production of pycnidia or sclerotia in the host tissues.

Pycnidia was also obtained on bean (*Phaseolus vulgaris*) from a C strain isolated from banana and from one obtained from tea, in addition to those from the bean and sunflower strains [ibid., viii, p. 138] previously established. Except under special circumstances the strains under observation (which are considered as being a representative sample) are unable to parasitize the stems of pigeon pea and bean. Seedling inoculations of the two last-named hosts confirmed this conclusion.

M. phaseoli was found to be extremely plastic in culture, and it is thought possible that a similar plasticity in its pathological action may account for the inconsistency in the results obtained by the author and other workers.

The cultural characters of the strains are described in detail, and tables are given showing their chromogenesis and range of mean sclerotial size; details and results of numerous inoculation experiments are also tabulated.

De Souza da Camara (M.). **Proposta de divisão do genero Stemphylium Wallr., fungo da ordem das Hyphales (Mart.) em. Sacc. et Trav.** [Proposal for the division of the genus *Stemphylium* Wallr., a fungus of the order Hyphales (Mart.) em. Sacc. et Trav.]—Lisbon, Emprêsa do Anuario Comercial, 21 pp., 8 figs., 1930.

The writer furnishes a Latin diagnosis of *Stemphylium dendriticum* n. sp., occurring on the spots produced by *Fusicladium dendriticum* [*Venturia inaequalis*] on apple and by *F. dendriticum* f. *eriobotryae* on *Eriobotrya japonica* in Portugal. The fungus is characterized by black, pulvinate, subglobular, confluent stromatic masses; slender, filiform, pluriseptate, pale ferruginous, dendritically branched conidiophores (up to 7 μ in thickness); and racemose, pleurogenous as well as acrogenous, polymorphous, echinulate conidia, measuring 15 to 24 by 10 to 15 μ, with 1 to 3 chestnut-coloured transverse septa and 1 to 2 brown longitudinal ones.

Discussing the systematic position of the fungus, the writer draws attention to the confusion prevailing with regard to the genus *Stemphylium* owing to the fact that it includes species having both acrogenous and pleurogenous conidia. This condition could be remedied by the creation of a new genus, *Soreymatosporium*, for fungi having pleurogenous conidia, *Stemphylium* being maintained for those of the acrogenous type.

Tunstall (A. C.). **Vegetable parasites of the Tea plant (continued). Blights on the root.**—*Quart. Journ. Indian Tea Assoc., 1930*, 1, pp. 28–36, 1930.

Continuing his survey of the vegetable parasites of the tea plant [*R.A.M.*, ix, p. 68], the author gives notes on the symptoms, effects, life-history, and control of *Fomes lamaoensis* [ibid., viii, p. 531], *Ganoderma applanatum* [ibid., iii, p. 5], *F. lignosus* [ibid., viii, p. 267], and *G. lucidum* [ibid., vi, p. 514].

F. lamaoensis rarely produces fruit bodies in north-east India, only three specimens having hitherto been found by the writer. Infection can usually be traced along the tea roots to rotting tree stumps, fence posts, wooden bridges, or any kind of dead wood, on which the fungus may live for years. For instance, at Tocklai an outbreak of *F. lamaoensis* was traced to a piece of *Mesua ferrea* root which must have been buried four feet deep in the soil for at least 14 years. The fungus does not spread through the soil, nor does it appear to live in the soil apart from dead wood. *F. lamoensis* has been successfully cultured in the Tocklai laboratory, but no fructifications have been produced, and repeated attempts to inoculate living roots with mycelium from pure cultures gave negative results. Successful inoculations were obtained only by tying pieces of dead wood, previously inoculated with the mycelium of the fungus, to the roots and covering them up with soil. Out of five bushes thus inoculated in the field, one was killed in 15 months, but the remainder showed no clear signs of infection after two years.

F. lamaoensis is always most prevalent on sandy soils which have recently been opened out from virgin forest. The older

forests of Assam on sandy soil are badly infected. If the fungus is allowed to spread, acres of tea may be destroyed in a few years. The writer has sometimes seen up to twenty acres killed in one patch. Usually mature bushes are attacked, but in one case thousands of plants died in a year on a young clearance. All dead bushes and their immediate neighbours should be uprooted, and the soil cleared of wood and roots. This is much more effective than trenching.

G. applanatum causes no appreciable damage in north-east India, where only one case of infection by this fungus has so far been observed (in the Darrang district in 1924).

F. lignosus is also of comparatively rare occurrence in north-east India, where the acidity of the soil is unfavourable to its development. As it can spread through the soil, isolation of infected areas by trenches is recommended, in addition to eradication of the diseased bushes.

G. lucidum is commonly found on jungle trees in the vicinity of tea plants but seldom attacks the latter. Eradication of diseased bushes and removal of wood from the soil is the best measure of control.

GADD (C. H.). **Report of the Mycologist.**—*Tea Res. Inst. Ceylon Bull.* 4 (*Ann. Rept. for the year 1929*), pp. 9–12, [? 1930.]

In this annual report [which is compiled on the same lines as the preceding ones: *R.A.M.*, viii, p. 469], the author gives notes on the principal diseases of the tea bush observed in 1929 in Ceylon. Most of the information presented has already been noticed from other sources.

Limitation on special permit plant material entered for propagation purposes under Regulation 14 of quarantine No. 37, nursery stock, plant and seed quarantine.—*U.S. Dept. Agric., Plant Quarantine and Control Admin. Leaflet*, 4 pp., 1930. [Mimeographed.]

The new limitations (effective as from 1st July, 1930) on the importation into the United States of special plant material entered for propagation purposes under Regulation 14 of Quarantine No. 37 [*R.A.M.*, viii, p. 814] fix the maximum quantity of each genus or type that may be imported for the above-mentioned object by any permittee during a given year. Thus, provided the total number of roses imported by an individual grower in any one year does not exceed 1,000, he may import 1,000 rose plants of any one variety not already available in the United States, or one or more plants of several such varieties. Further importations of such varieties (within the appointed limits) may be made in each succeeding year until sufficient material is available for propagation. Therefore, while reducing the total volume of plant material obtainable by special permit, these regulations conform more closely to actual requirements. The quantity limits for the various genera [which are listed] vary from 10,000 and 5,000 for *Colchicum* and *Anemone* bulbs, respectively, to 100 for seedlings of various trees, shrubs, and other ornamental plants.

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HOPKINS (J. C. F.). **Further experiments on the control of white mould (Erysiphe cichoracearum DC.) of Tobacco, 1927–28.** —*Rhodesia Agric. Journ.*, xxvii, 4, pp. 381–387, 1930.

Further tests made in Southern Rhodesia on the control of white mould of tobacco (*Erysiphe cichoracearum*) [*R.A.M.*, viii, p. 341] by applications of sulphur to the soil with or without priming showed that the best control was given by high priming (removing the lower leaves to 10 or 15 in. from the ground to allow of 'topping' down to 9 or 10 large leaves) in conjunction with a soil dressing of 20 lb. sulphur per acre. Plots with a total of 620 plants so treated showed 26·5 infected plants as compared with 378 in the untreated control. Priming alone, without any soil application of sulphur, gave 88 infected plants, the corresponding figure for the control being 398. The same amount of sulphur applied to unprimed plants gave no control, but 40 lb. of sulphur applied in two equal amounts gave 56 infected (unprimed) plants as compared with 185 in the untreated control, while 60 lb. sulphur in two dressings of 40 and 20 lb., respectively, gave 82 infected (unprimed) plants, as compared with 153 in the untreated control plot.

The primed plots yielded 658·8 lb. of green leaf per acre, with 49 per cent. wastage (chiefly due to *Bacterium angulatum* and *Cercospora nicotianae*), as compared with 583·2 lb. green leaf and 54 per cent. wastage in the unprimed plots. This difference in yield was greatest in the graded leaf.

DAY (W. R.). **The 'javart' disease of Sweet Chestnut. Cytodiplospora castaneae Oudemans (= Diplodina castaneae Prillieux et Delacroix).**—*Quart. Journ. of Forestry*, xxiv, 2, pp. 114–117, 3 figs., 1930.

A sweet chestnut [*Castanea sativa*] pole submitted for examination from Midhurst [Sussex] was found to be infected by *Diplodina (Cytodiplospora) castaneae* [*R.A.M.*, vii, p. 206], which was probably responsible for the death of the wood and the serious die-back affecting the rest of the coppice. Certain patches of the bark show up as bright brown against the dark purplish-grey of the normal parts. The fructifications of the fungus appear on the brown patches as small, black dots which have ruptured the bark and

protrude slightly above it. At maturity they consist of nearly black stromata, the outer parts of which contain a number of pycnidia with separate openings, lined with simple conidiophores bearing hyaline, fusiform, uniseptate conidia measuring 9 to 12 by 2·5 to 3 μ.

Prillieux and Delacroix found *D. castaneae* causing small cankers on the stems of young coppice shoots in Limousin (*Bull. Soc. Myc. Fr.*, ix, p. 275, 1893). There is also a mild form of the disease in which infection is confined to the end of the shoots. The control measures recommended include the destruction of all infected material and the isolation of the diseased area by trenches to prevent the possible spread of the fungus from root to root.

The chief difference between *Diplodina* and *Cytodiplospora* is that in the former the pycnidia are separate and distinct, while in the latter several occur in a stroma. The fructifications of the sweet chestnut fungus vary, but they generally agree with *C. castaneae*, which was originally found on a chestnut branch near Scheveningen, Holland, and is probably not an uncommon saprophyte.

The French word 'javart' (corresponding to the English 'quittor') is a veterinary term applied to ulcers occurring between the hoof and hair of horses and aptly describing the small, deep cankers on chestnut shoots.

Bowen (P. R.). **A Maple leaf disease caused by Cristulariella depraedans.**—*Connecticut Agric. Exper. Stat. Bull.* 316, pp. 625–647, 8 pl., 1930.

In September, 1928, sugar maples (*Acer saccharum*) at North Stamford, Connecticut, were observed to be suffering from a disease characterized in the initial stages by circular, flaccid, greyish spots, about 1 mm. in diameter, which increased in size and finally merged into large, irregular, dry but still green areas frequently covering the entire leaf blade. By the end of the month the infected areas had become greyish-brown and withered. Many of the blades were cracked or had broken away from their point of attachment to the petioles and eventually premature defoliation resulted. Subsequently the same disease was found on *A. saccharum* in other localities of the State, while silver maples (*A. saccharinum*) were also affected at Hurd Park.

Irregularly globular, somewhat flattened fruiting heads, 100 to 150 μ in diameter, composed of compact cells and each borne on a simple sporophore averaging 150 μ in length, were scattered over the affected parts of the leaf. These bodies were attached to delicate, sparsely branched, abruptly sinuous, multiseptate hyphae, 4 to 7 μ in width, growing scantily on the surface. In artificial culture the fruiting heads were smaller and looser in structure than those on the leaf surface, and were composed of a cluster of basidium-like cells, each of which bore at its upper extremity a globular conidium 2 to 3 μ in diameter.

From the above-mentioned characters the maple fungus appeared to belong to the section *Cristularia* of the genus *Botrytis* as defined by Saccardo. A review of the literature indicated that the causal organism of the disease was identical with that described by Cooke

in 1885 (*Journ. Quekett Microscop. Club*, Ser. II, 2, p. 138) as *Polyactis depraedans*, a name later (1886) changed by Saccardo to *B. depraedans*. In 1908, when the same disease was discovered in Germany on *A. pseudoplatanus*, Saccardo named the causative fungus *Illosporium diedickeanum* (*Ann. Myc.*, vi, p. 553). Von Höhnel in 1916 (*Sitzungsber. K. Akad. Wiss. Wien, Math.-Naturw. Kl.*, Ab. I, cxxv, p. 27) changed this name to *Cristulariella depraedans*, with a description agreeing well with the Connecticut disease. A comparison of the American material with Cooke's type specimen gave further confirmation of the identity of the maple disease in the United States and Europe.

Inoculations on potted sugar maple trees with pure cultures of the fungus (mycelium and spore suspensions) resulted in the development of the typical symptoms of the disease as observed in the field. The occurrence of infection is favoured by abundant atmospheric humidity and high temperatures.

Tubeuf [C. v.]. **Biologische Bekämpfung des Blasenrostes der Weymouthskiefer.** [Biological control of the blister rust of Weymouth Pine.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xl, 4, pp. 177–181, 1930.

A brief account is given of the writer's successful experiments in the control of blister rust of *Pinus strobus* and *P. sylvestris* (*Cronartium* [*ribicola*] and *C. asclepiadeum*) [*R.A.M.*, viii, p. 344] by means of their natural enemy, *Tuberculina maxima* [cf. ibid., v, p. 314]. The mode of dissemination is extremely simple, consisting merely of collecting the lilac-coloured spore dust of the parasite in a paper bag, and transferring it to the aecidia of the rusts with the tip of a penknife. The author's previous appeals for the replacement of the susceptible *P. strobus* and *P. monticola* by the immune *P. peuce* are recapitulated [ibid., vii, p. 482].

Roeder. **Zur Frage der Kienzopfverbreitung.** [On the question of the distribution of resin top.]—*Zeitschr. für Forst- u. Jagdwesen*, lxii, 4, pp. 241–242, 1930.

The writer's observations at Runkel in the pine stands of the valley of the Lahn [Hesse-Nassau] are stated to confirm Liese's data as to the direct transmission of the resin top fungus *Peridermium pini* from tree to tree [*R.A.M.*, ix, p. 421], and also as regards individual variations in susceptibility to the disease. In the districts under investigation the fungus chiefly attacks the trees which have sprung from consignments of inferior seed procured from a western firm during 1903–5, whereas individuals of the 60- to 80-year-old stands, the origin of which is unknown, are virtually free from infection. In the younger trees infection appears to have occurred through injuries on the bark inflicted by the branches of oaks, beeches, etc., in rubbing or swaying.

Liese (J.). **Das Auftreten des Zählings (Lentinus squamosus) an kiefernen Eisenbahnschwellen.** [The occurrence of the scaly *Lentinus* (*L. squamosus*) on Pine wood railway sleepers.] —*Der Bahnbau, 1929*, 51, 2 figs., 1929. [Abs. in *Forstarch., 1930*, 10, pp. 193–194, 1 fig., 1930.]

Pine wood sleepers on various German railways, especially in

East Prussia, have been extensively attacked of recent years by the scaly *Lentinus* (*L. squamosus*) [*L. lepideus*: *R.A.M.*, ix, p. 147]. Though superficially sound, the affected sleepers showed an intensive decay of the heartwood, which emitted the characteristic odour of balsam of Peru. In some cases only the sapwood cylinder, protected by impregnation, remained sound. The fungus occurs as a pure saprophyte in the forest, and the infection of the sleepers must have taken place after they were laid down. In almost every case the fungus was found to have entered the wood through bore holes. In modern practice these are usually made before impregnation, but where the wood has to be pierced after treatment it should be coated with tar. The fructifications of the fungus should be collected and destroyed during May and June.

Bose (S. R.). **Biology of wood-rotting fungi common in forest areas.**—*Journ. Linnean Soc. London, Bot.*, xlviii, 323, pp. 417–438, 4 pl., 1930.

The purpose of the present paper is the examination and discussion of the biological peculiarities of twelve species [which are enumerated] of wood-destroying fungi. In most of the artificial cultures (which were made on blocks of wood as well as in tubes and plates of malt agar) the fungi usually failed to produce pilei; however, nearly all the species formed sporophores on malt-extract agar. Some general observations are made on the germination of basidiospores and the presence of basidia; the influence of gravity and sunlight on the cultures; the position of sporophores on the media; the density of the mycelium and sporophore formation; and the length of the life-cycle in different media.

Barr (H. T.). **Laboratory studies on toxic chemical control of wood destroying fungi.**—*Agric. Engin.*, xi, 4, pp. 161–163, 1 fig., 1930.

Three years ago a large number of pine and oak fence-post specimens were treated at the Arkansas Agricultural Experiment Station with creosote, zinc chloride, sodium fluoride, borax, sulphur, refuse cylinder oil, lime-sulphur spray fluid, and lubricating oil emulsion spray fluid. Two years after setting the treated posts showed little or no damage as compared with 33 per cent. rotting and 7·7 per cent. total collapse of the controls.

In order to supplement the field work, a laboratory study was conducted during the past year to determine the efficacy of some wood preservatives against the wood-destroying fungi *Fomes annosus*, *Lentinus lepideus*, and *Lenzites sepiaria* [*R.A.M.*, ix, pp. 78, 80, 217, *et passim*]. The following preservatives were used: copper aceto-arsenite at the rate of 1·28 lb. dry chemical per cu. ft. of southern yellow pine [*Pinus palustris*] wood, copper arsenite 1·50 lb., copper borate 1·42 lb., zinc chloride 1·41 lb., sodium fluoride 1·26 lb., molten sulphur 27·5 lb. (dry), creosote 30 lb., and refuse cylinder oil 26·2 lb. A treatment of 45 minutes at 180° F., followed by a cold treatment of 4 hours at 70°, was given in every case except that of molten sulphur. In the copper treatments arsenious oxide or sodium tetraborate was first applied hot and copper acetate or copper sulphate used in a bath at

70°. As the copper came into contact with the arsenious oxide or sodium tetraborate, a precipitate, insoluble in water but soluble in weak acids, was formed in the wood.

In order to obtain an effect comparable to that of prolonged leaching in the field, six pieces of each treatment were boiled in distilled water for one hour, rinsed, and reboiled for another hour. A second six pieces of each treatment were alternately soaked in distilled water and dried for 48 hours each during three months. After a week's exposure to the air in the laboratory each set of treated pieces was sterilized with steam under 15 lb. pressure for 30 minutes. Pure cultures of the above-mentioned fungi were grown in sterilized test tubes on a 2·5 per cent. malt syrup agar medium. The sterilized pieces of wood were then placed in the inoculated tubes and transferred to the incubator. Measurements of fungous growth [which are tabulated and figured] were taken at intervals of 4, 25, and 50 days after inoculation.

Copper borate was found to be one of the most promising of the treatments on account of its toxicity to all the fungi used in the tests, its permanency, and its relatively low cost. Copper arsenite and copper aceto-arsenite were also effective.

Wellman (F. L.). **Club-root of crucifers.**—*U.S. Dept. of Agric. Tech. Bull.* 181, 31 pp., 3 figs., 1930.

Full particulars are given of the writer's extensive investigations on the life-history and control of *Plasmodiophora brassicae* [*R.A.M.*, viii, pp. 4, 5], the causal organism of club-root of crucifers, with special reference to cabbage under Middle Western conditions.

Laboratory studies showed that spore germination, the details of which are fully described, occurs over a temperature range of 6° to 27° C., with an optimum at 18° to 25° (peak at the latter point). The range for the development of the disease is 12° to 27°, with an optimum at 18° to 25°, and the most malignant attacks at 25°.

The host was found to contract infection in 18 (sometimes 10) hours in infested soil with a relatively excessive moisture content (80 per cent.), indicating that adequate drainage alone is not sufficient to prevent attacks of the fungus on the occurrence of heavy rain.

A survey of club-root infested fields in Wisconsin, Indiana, and Illinois showed some cases of serious infestation in soils with a naturally high lime content. A hydrogen-ion concentration survey of 116 infested soils showed that infection occurred at a range of P_H 5 to 7·8, which was also found to be the range covered by samples of cabbage-growing soils selected irrespective of disease. The action of certain alkaline chemicals was studied by adding them at varying rates to infested soils. In a soil with a hydrogen-ion concentration of P_H 7·2 the addition of K_2CO_3 produced a reaction of P_H 8·1 without inhibiting the disease, which was, however, completely suppressed by the application of $Ca(OH)_2$ in sufficient quantities to produce a hydrogen-ion concentration of P_H 7·3. The P_H determinations in a test on a seriously infested field treated with different quantities of several types of

commercial liming materials ranged from 6·4 to 8·1. The heaviest incidence of club-root occurred in soils with hydrogen-ion concentrations of P_H 6·4, 6·5, 6·7, 7·1, or 7·5, and the highest percentage of normal plants developed at P_H 6·7, 7·1, 7·5, 7·8, 7·9, 8, or 8·1. Plants so severely diseased that heading was inhibited occurred in plots showing reactions of P_H 6·5, 6·7, 6·8, and 7·6, while in other plots at P_H 6·8 and 8 no plants were killed by *P. brassicae*. It would appear, therefore, that no correlation exists between the severity of the disease and an increase in the active alkalinity of the soil.

The results of control experiments on badly infested soil in Kenosha County, Wisconsin, with different types of lime indicated that chemically pure $CaCO_3$, raw ground limestones of either high calcium or dolomitic types (predominantly $CaCO_3$), and gypsums ($CaSO_4$, $2H_2O$) are not effective club-root inhibitors. Commercial air-slaked lime and a compound in which air-slaked and ground limestone were used together at the rate of at least 6 tons per acre proved satisfactory in some cases, while effective control was given by chemically pure CaO, quicklime, ground burnt or stone lime (predominantly CaO), chemically pure $Ca(OH)_2$, and commercial hydrated limes (predominantly Ca $(OH)_2$). In thoroughly infested seed-beds it was found necessary to apply at least 1,500 lb. of hydrated lime per acre for adequate control. Excessive amounts of raw ground limestone failed to inhibit the disease, while the preventive effects of air-slaked limes were questionable. Hydrated lime at the rate of one-half ton per acre held the disease in check to some extent, but it was necessary to apply 2 tons per acre in order to obtain commercially satisfactory control on the soil in question.

Walker (J. C.). **Inheritance of Fusarium resistance in Cabbage.**—*Journ. Agric. Res.*, xl, 8, pp. 721–745, 1 col. pl., 2 figs., 1930.

This is the full account of the author's investigation of the nature of the inheritance in cabbage of resistance to yellows (*Fusarium conglutinans*), an abstract of which has been noticed from another source [*R.A.M.*, ix, p. 422].

Chupp (C.). **The effects of potash and phosphorus on tip burn and mildew of Cabbage.**—*Phytopath.*, xx, 4, pp. 307-318, 1 fig., 1930.

Tipburn of cabbage (chiefly Danish Ballhead) is stated to be fairly general and sometimes severe in New York State, where the author first diagnosed the trouble ten years ago. The leaves of the affected plants nearly all showed dead, brown or black margins, the lower foliage being spotted with *Alternaria*. In very severe cases the whole plant was somewhat dwarfed and loose of head.

It was found by means of experiments [the results of which are discussed and tabulated] that heavy applications of superphosphate (acid phosphate) increased the amount of tipburn, especially when associated with a lack of nitrogen and potash. On the other hand,

muriate of potash reduced the incidence of tipburn sufficiently to recommend it as a practical control measure, the fertilizer ratio 1–2–2, as represented by some such formula as 5–8–7, being approximately correct.

Downy mildew of cabbage (*Peronospora parasitica*) was much in evidence on one farm where the tipburn experiments were conducted; the outcome of preliminary tests indicates that the incidence of this disease may be increased by potash and nitrogen [but see *R.A.M.*, viii, p. 213], while phosphorus appears to decrease it.

BURKHOLDER (W. H.). **The bacterial diseases of the Bean. A comparative study.**—*Cornell Agric. Exper. Stat. Mem.* 127, 88 pp., 6 pl., 15 figs., 1930.

This is a comprehensive account of the writer's comparative investigations on the bacterial diseases of beans [*Phaseolus vulgaris*] caused by *Phytomonas* [*Bacterium*] *phaseoli* [*R.A.M.*, viii, p. 348], *Bact. flaccumfaciens* [ibid., vii, p. 215], *Bact. medicaginis* var. *phaseolicola* [ibid., ix, p. 424], *Bact. phaseoli* var. *fuscans* n. var., *Bact. vignae* var. *leguminophila* n. var., and *Bact. viridiflava* n. sp., the chief differences between the symptoms and cultural characters of which are shown in tabular form and fully described.

Bact. phaseoli var. *fuscans* was found on beans at Montreux and Lucerne, Switzerland, in 1924 and 1927, respectively. The lesions produced by this organism were identical with those of *Bact. phaseoli*, except that the former are inclined to split the stems. *Bact. phaseoli* var. *fuscans* turned the agar medium a distinct brown colour. This organism was also isolated by Miss Hedges from diseased bean seed imported from South America.

Bact. vignae var. *leguminophila* was isolated in 1926 from diseased leaves of garden beans in New Jersey which showed small, reddish-brown, slightly raised lesions. The colonies of this organism were larger and more rapidly growing than those of *Bact. medicaginis* var. *phaseolicola* and produced a green fluorescent pigment on beef extract agar. A slightly different strain of *Bact. vignae* var. *phaseolicola* was isolated from *Vigna sesquipedalis*.

Bact. viridiflava was found producing reddish-brown, circular lesions on beans of the Refugee type at Lucerne in 1927. The colonies of the organism are white to cream-yellow and produce a green, fluorescent pigment. This was apparently the most virulent of all the organisms described in the present study.

Cross-inoculation experiments showed that *Bact. phaseoli* can infect beans, *P. lunatus*, *P. coccineus*, *Lupinus polyphyllus*, and *Dolichos lablab*; *Bact. phaseoli* var. *fuscans*, beans, *P. lunatus*, *P. coccineus*. *P. angularis*, *V. sinensis*, *V. sesquipedalis*, and *D. lablab*; *Bact. medicaginis* var. *phaseolicola*, beans, *P. lunatus*, and *P. coccineus*; *Bact. vignae* var. *leguminophila*, beans, *P. lunatus*, *V. sinensis*, *V. sesquipedalis*, *Glycine max* (pods), *D. lablab* (pods), *Pueraria hirsuta*, and *Vicia faba*; *Bact. viridiflava*, beans, *P. lunatus*, *P. coccineus*, *V. sinensis*, *G. max* (pods), *D. lablab*, and *Pueraria hirsuta*.

Wieringa (K. T.). **De vetvlekkenziekte, een voor Nederland nieuwe ziekte bij bruine Boonen (Phaseolus vulgaris).** [The grease spot disease, a new disease of brown Beans (*Phaseolus vulgaris*) for Holland.]—*Tijdschr. over Plantenziekten*, xxxvi, 4, pp. 84–88, 1 pl., 1930.

In July, 1929, the writer examined some bean (*Phaseolus vulgaris*) specimens which were found to be suffering from the so-called 'grease spot disease' [the symptoms of which are briefly described: *R.A.M.*, viii, p. 692]. The bacterium isolated from the affected plants produced the typical symptoms of the disease on the purple-flowering varieties, while the white-flowering Caka and Double Princess remained immune. Similar results were obtained in inoculation tests with the cultures of *Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [see preceding abstract] received from Stapp and Kotte, with which the Dutch organism is believed to be identical.

Nevodovsky (G. S.). Вплив цвільових грибів на розвиток кореневїду Бурякових сходів. [The effect of mould fungi on the development of root rot of Sugar Beet seedlings.]—*Наукові Записки з Цукрової Промисловости* [*Sugar Industry Scient. Notes*], Kieff, ix, 1–2, pp. 133–140, 1930. [Ukrainian, with English summary.]

In referring to his own and Mouravieff's previous studies of the seedling root rot of sugar beet in the Ukraine [*R.A.M.*, viii, p. 7], the author states that so far *Phoma betae* alone has been definitely proved to be one of the causal organisms involved in the disease in that country. The fact, however, that artificial infection of beet seed-clusters with Sphaeropsidaceae and the admixture with the soil of seed-beds of infected beet roots failed to increase the incidence and severity of the disease to any considerable degree, led him to consider the possibility of some other soil-inhabiting organisms being also involved in the causation of the rot. Accordingly he investigated the fungal population of sugar beet roots freshly harvested and after a certain time of storage in silos; the isolations yielded a variety of species, mostly of mould fungi [a list of which is given], some of which were also found in the soil of the beet fields. Experiments on plots in the neighbourhood of Kieff in 1928–9 showed that the majority of the fungi isolated had no consistent effect on the development of root rot of seedlings. The species of *Oospora* tested [but not specified] appeared, however, to increase the incidence of the disease, while *Torula convoluta* consistently decreased it. No explanation has so far been found for these results, but the author points out the possible practical importance of the results with *T. convoluta*, should further experiments confirm them.

Coons (G. H.), Stewart (D.), & Larmer (F. G.). **The Sugar Beet leaf spot disease and its control by direct measures.**—*U.S. Dept. of Agric. Circ.* 115, 20 pp., 5 figs., 1 graph, 1930.

This is a more detailed account, accompanied by five tables, of recent experiments in the Arkansas Valley in the control of leaf spot of sugar beets (*Cercospora beticola*) by dusting from a motor

truck with copper sulphate and lime (20 : 80) than that already noticed from another source [*R.A.M.*, ix, p. 9]. Some general observations are made on the part played by the fungus in the causation of leaf spot epidemics, and on the relation between the latter and climatic factors.

Paasch (E.). **Ursache und Bekämpfung der Herz- und Trockenfäule.** [Cause and control of heart and dry rot.]—*Centralbl. für Zuckerind.*, xxxviii, 14, pp. 403–405, 1930.

A study of the records of the incidence of heart and dry rot of beets [*R.A.M.*, ix, p. 10] in relation to meteorological conditions on the Heinrichau estate, Breslau, from 1886 to 1929, inclusive, shows that the disease is most prevalent in seasons characterized by more or less protracted dry periods between mid-June and mid-September. An excess of lime in the soil also appears to favour heart and dry rot, which in one experiment was found to occur most severely at a hydrogen-ion concentration of P_H 8 and to be practically absent at P_H 6·8. The use of calcareous fertilizers on dry, alkaline soils should therefore be avoided.

Labrousse (F.). **L'anthracnose du Pois Chiche (Cicer arietinum).** [Anthracnose of the Chick Pea (*Cicer arietinum*).]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 4, pp. 174–177, 1 pl., 1930.

An account is given of a disease of chick peas (*Cicer arietinum*) originally recorded in 1929 from Morocco (where it is stated to be very destructive), and studied on the living plant in experimental plots at Versailles. The disease affects all the aerial organs of the host. On the leaflets it causes rounded or elongated spots bearing irregularly dispersed brown dots, surrounded with a brownish-red margin, and measuring 8 to 10 by 5 to 6 mm. in diameter. On the green pods the spots are superficial and bear black dots disposed in several more or less concentric circles ; the seeds do not appear to be attacked. On the stem and petioles the spots are brown, elongated (3 to 4 cm. in length), bearing black dots, and may girdle the attacked organ, in which case the portion above the point of attack is rapidly killed. The main stem may be girdled by the organism at the collar, when the whole plant dies.

The pycnidia borne on the spots are sub-globular, sub-epidermal, 100 to 260 by 160 to 180 μ in diameter, with a raised ostiole 20 to 25 μ in diameter. The pycnospores are continuous, usually cylindrical with rounded ends, 6 to 12 by 4 to 6 μ (average 9 to 10 by 4 to 5 μ), borne on sterigmata 4 to 8 by 2 to 3 μ in diameter. The large-sized spores are occasionally slightly constricted in the middle. Two-celled spores were never found in nature, but a few were observed in pure cultures.

The author considers that the causal organism is *Phyllosticta rabiei*, in spite of the morphological differences between it and Trotter's diagnosis. The fact that garden peas growing in the vicinity of the infected chick peas remained immune would indicate that the fungus is not *Ascochyta pisi*, unless it could be demonstrated that biological strains exist in the latter.

Owing to the conditions under which the crop is extensively cultivated in Morocco, the author considers that control of the

disease by spraying with Bordeaux mixture, as recommended by Del Cañizo [*R.A.M.*, vii, p. 357], is not commercially practicable there. The development of resistant varieties would appear to be more promising, since individual variations in susceptibility were noticed in his experiments, and since Singh [ibid., vii, p. 559] observed in India that early varieties are more resistant than late ones to the similar disease attributed by him to *Mycosphaerella pinodes*.

McClean (A. P. D.). **The bacterial wilt disease of Peanuts (Arachis hypogaea L.).**—*S. Africa Dept. of Agric. Sci. Bull.* 87, 14 pp., 7 pl., 1930.

This is a brief account of a bacterial disease of groundnuts (*Arachis hypogaea*) which was recorded for the first time from South Africa during 1924–5 in the coastal belt of Natal, where it has since recurred every year. The symptoms of the disease and the morphological and cultural characters of the causal organism agree closely with those of the slime disease (*Bacterium solanacearum*) of groundnuts in the Dutch East Indies [*R.A.M.*, vii, p. 277]. The disease is so far absent from the commercial groundnut areas of the Transvaal, and in Natal is apparently restricted to soils of the heavier loam type. Observations indicate that conditions conducive to waterlogging of the soil favour the development of the disease, and that the bacterium is primarily dependent on the moisture-holding capacity of the soil for its existence; there was also evidence that repeated cropping with groundnuts increased the incidence of the disease.

Details are given of inoculation experiments which showed that the organism is equally pathogenic to groundnuts and tomatoes, and that passage through the latter did not reduce its pathogenicity to the former. On tobacco seedlings of the Joiner variety the organism was only partially pathogenic, as definite wilt symptoms were produced by inoculation on only one leaf of each plant tested, and at the conclusion of the experiment all the inoculated seedlings had recovered.

So far the disease is of minor economic importance in Natal, where groundnuts are not commercially grown, but in the event of an extension of their cultivation the control measures recommended are the restriction of plantings to the more sandy and dry types of soil, and the use of resistant varieties, among which the Javan varieties have shown very definite resistance to the disease under local conditions.

Kovačevski (I. C.). Нови изследвания върху етиологията на „черното гниене" по Сусама. [New investigations of the etiology of 'black rot' of Sesame.]—*Annuaire Univ. de Sofia, Fac. Agron. et Sylvicult. 1929–1930*, viii, pp. 455–468, 1930. [English summary.]

This is an account of the author's study of the bacterial disease of sesame which was first recorded and described from Bulgaria under the name 'black rot' by Malkoff in 1903, and was attributed by him to *Pseudomonas* [*Bacterium*] *sesami* and *Bacillus sesami* [*R.A.M.*, v, p. 519], either singly or in combination. Inoculation

experiments in 1929 [some details of which are given] showed, however, that the last-named organism is not pathogenic to sesame seedlings, Malkoff's results being explained by the fact that, as indicated by his own description, he worked with isolations the purity of which was questionable. *Bact. sesami*, on the other hand, reproduced all the symptoms observed in nature, which are also described, this proving it to be the real cause of the disease.

Bact. sesami (the name of which under modern classification, according to the author, should be *Phytomonas sesami* No. 211·2322032) is a short and thin (2·7 by 0·8 μ), hyaline, weakly motile, non-sporiferous, Gram-negative rod with rounded ends and one or several polar flagella. On potato agar it forms greyish-white, transparent, rounded, flat colonies, not discoloring the substratum. The optimum and maximum temperatures for growth are 25° to 28° and 35° C., respectively, and the thermal death point is about 49°. The optimum acidity is between 15° and 18° of Fuller's scale, with a maximum at 30° and a minimum at −15°. The bacterium is highly resistant to desiccation and freezing, and cultures retained their viability and pathogenicity after 10 months. A technical description of the organism is given in Bulgarian, and a description is also given of its cultural characters on various media.

A careful comparison of the morphological and cultural characters of *Bact. sesami* with those of *Phytomonas solanacearu* [*Bact. solanacearum*], as well as inoculation experiments with the former on tobacco and potato seedlings which gave negative results, lead the author to consider that the two organisms are entirely distinct [cf. ibid., ix, p. 577].

Musiani (A.). **Quando applicare i trattamenti contro la peronospora della Vite.** [When to apply treatments for the control of Vine mildew.]—*L'Istria Agric.*, N.S., x, 8, pp. 175–179, 1930.

The author states that most of the failures experienced by vine-growers in the control of the vine mildew [*Plasmopara viticola*] may be traced to wrong timing of the applications. In his view the best moment for spraying the vines with copper sprays is when the characteristic 'oil spots' appear on the leaves, denoting the first penetration of the germ-tubes of the fungus. No particular difficulty should be encountered in the detection of the first spots, since they may be expected to form within 10 to 12 days in the spring and 6 or 7 days in the summer after a rain or abundant dew in an ordinary season. During prolonged rainy spells, however, this criterion is not valid, and the sprays should be applied at the first break in the rain, and should be supplemented with applications of cupric sulphur dusts, which are also effective against other fungal parasites of the vine and do not affect adversely the setting of the fruit.

Preston (N. C.). **Part I. Report of the Advisory Mycologist, April, 1929–March, 1930.**—*Rept. Advisory Dept. Harper Adams Agric. Coll., Newport, Salop*, v, pp. 5–9, 1930.

To ascertain the value of a simplified method of applying

mercuric chloride for the control of finger-and-toe disease of cabbage [*Plasmodiophora brassicae*: *R.A.M.*, viii, p. 629] the original 'watering in' method, by which about one-half pint of a 1 in 1,500 or 1 in 2,000 solution was applied to each hole immediately before planting, was tested against the easier 'dipping' method, which consists in adding dry soil to a quantity of the solution and dipping the plants in the mixture before setting. The results obtained [which are tabulated] were invariably in favour of the former method, which gave a minimum decrease in the number of severely clubbed plants of 43 per cent. and a maximum decrease of 80 per cent., as compared with the controls; the 'dipping' method in no case gave a decrease of more that 26 per cent., and in certain instances the number of badly clubbed roots in the plots so treated was above that in the controls. A dressing of 1 cwt. per acre of calcium cyanamide gave no satisfactory control of the disease in swedes and cabbages, though a slight reduction in infection was obtained in some plots. Other [unnamed] substances gave promising results, and tests with these are in progress.

When potatoes were planted at fortnightly intervals from April to July no clear relation was observed between the stage of growth of the plants and the severity of attack by *Phytophthora infestans*.

Mycological investigations.—*Fifteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1929*, p. 37, 1930.

The following diseases not previously reported at Cheshunt occurred during 1929: root rot of *Asparagus plumosus* and gladiolus, bulb rot of narcissus and tulips, foot rot of *Pelargonium* cuttings, and wilt of pinks [*Dianthus*], all caused by species of *Fusarium*; damping-off of asters (*Phytophthora cryptogea*) [*R.A.M.*, vi, p. 669]; and wilt of chrysanthemums (*Verticillium* sp.) [ibid., vi, p. 215].

Ogilvie (L.). **Observations on the diseases of market-garden crops in the Vale of Evesham.**—*Ann. Rept. Agric. & Hortic. Res. Stat., Long Ashton, Bristol, for 1929*, pp. 149–154. [1930.]

Notes are given in popular terms on the diseases noted since 1928 in the market gardens of the Vale of Evesham. Asparagus was affected by violet root rot (*Helicobasidium purpureum*) [*R.A.M.*, ix, p. 621] and by a slow deterioration or 'sickness' probably associated with potash deficiency in the soil; dwarf beans [*Phaseolus vulgaris*] were attacked by dry root rot (*Fusarium martii* var. *phaseoli*) [ibid., viii, p. 628]; peas showed a foot rot attributed to a *Fusarium*, and were also affected by downy mildew (*Peronospora viciae*), as well as by a bacterial disease probably identical with that caused in the United States by *Pseudomonas pisi* [loc. cit.]. A foot rot of asters caused by a *Fusarium* was also seen.

Plantesygdomme i Danmark 1929. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1929. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. for Planteavl*, xxxvi, 3, pp. 506–554, 4 figs., 2 graphs, 1930. [English summary.]

This report (compiled by E. Gram and Miss Anna Weber with the aid of a number of correspondents in various parts of Denmark) is prepared on the usual lines [*R.A.M.*, viii, p. 751]. Potatoes of the 1929 crop frequently showed rust-coloured, concentric spots, resembling those of 'kringerigheid' [ibid., ix, p. 478], in the tissues. Among the most severely affected varieties were Alpha, Juli, Jubel, Rosen, Eigenheimer, and a number of German varieties resistant to wart [*Synchytrium endobioticum*]. The dry summer is believed to be the primary factor in causing this condition.

For the first time for many years, *Fusarium minimum* [*Calonectria graminicola*] was widespread on rye, especially in Zealand. Seed-grain disinfection with various liquid mercurial preparations, as well as with tillantin C dust, gave promising results in the control of this organism. *F. culmorum* was largely responsible for damage to the grass of pastures and lawns [ibid., viii, p. 630]. Rye grass [*Lolium perenne*] was attacked by *Titaea maxilliformis* [ibid., viii, p. 752] following a long period of snow. An unusual feature of foot rot of cereals (*Ophiobolus graminis*, *F. culmorum*, and other fungi) [ibid., vii, p. 222] during the period under review was the severity of infection on oats following barley. Barley was heavily attacked by loose smut (*Ustilago nuda*) and yellow rust (*Puccinia glumarum*). In one case a winter barley stand was destroyed by the latter disease and infected a 20 hect. field of summer barley 300 to 400 m. away during a damp spell in July; the loss to the owner was estimated at Kr. 10,000 to 12,000. In another place the grain yield in a 10 hect. field was reduced by the rust from 40 to 12 hectokg. per hect. On the island of Møen the Binder variety of summer barley was extensively infected by rust from winter barley fully 10 km. distant, but the reduction in yield was not great. The Opal and Binder varieties proved susceptible, while Guld was resistant.

Darwin tulips at Kolding suffered from a disturbance, apparently of physiological origin, characterized by the development on the leaves and stalks of numerous brown streaks extending right down to the bulb, the new scales of which showed brown dots. Prof. van Slogteren, who examined some of the diseased material, stated that he had received similar samples from all parts of Europe during the season.

Siemaszko (W.). **Guzowatość korzeni drzew owocowych (Bacterium tumefaciens Sm. et Towns.).** [Crown gall of fruit trees (*Bacterium tumefaciens* Sm. et Towns.).]—Reprinted from *Choroby Roślin* [*Plant diseases*], Warsaw, i, 1, 4 pp., 1 fig., 1929. [Received September, 1930.]

This is a very brief account, based mainly on the work of other investigators, of the etiology and symptoms of crown gall (*Bacterium tumefaciens*) of fruit trees, and giving a few morphological and biological details of the causal organism. So far the

disease in Poland is stated to have been recorded only on apple and pear trees chiefly in nurseries (very rarely in the field), and also on sugar beet. The paper terminates with a few considerations on the suggested relationship of crown gall in plants to cancer in man and animals [see next abstract].

BENSAUDE (MATHILDE). **O cancro das plantas será um tumor maligno?** [Is crown gall a malignant tumour?]—*Actualidades Biol.*, i, pp. 173–221, 15 figs., 1929. [Received September, 1930.]

After distinguishing on morphological and histological grounds between malignant and non-malignant types of human and animal tumours the author describes and discusses in detail the investigations of Erwin Smith into the nature of crown gall (*Bacterium tumefaciens*) [*R.A.M.*, i, p. 164]. The reasons on which he based his view that the disease is a malignant tumour closely resembling cancer are reviewed and examined and the conclusion is drawn that they were conjectures based on negative evidence.

Referring next to the results obtained by Riker, and Robinson and Walkden [ibid., iii, pp. 15, 386], the author points out that they clearly demonstrated that, contrary to Smith's view, the proliferation in crown gall is due to the presence of bacteria, not in the cells but in the intercellular and intravascular spaces. They further showed that in crown gall no infiltration of the tissues takes place and that the tumoral strands as well as the secondary tumours arise by subdivision *in loco* of the cells in proximity to the bacterial foci.

The results obtained by these workers are fully discussed, and in the author's opinion the facts presented appear to prove crown gall to be an inflammatory granuloma slightly distinguished from other parasitic tumours by the presence of an initial necrosis consisting in a slight alteration of the cellulose walls nearest the parasite. The so-called 'secondary tumours' are not metastases, neither are they secondary, being composed of fragments of the primary tumours removed from the point of infection by the growth of the organs.

Reference is also made to the work of Kauffmann and others [cf. ibid., viii, p. 295] in isolating from human and animal cancers bacterial strains able to produce cellular proliferation in animal and plant tissues.

BERRIDGE (EMILY M.). **Studies in bacteriosis. XVI. The agglutinating and plasmolytic action of the sap of the Potato on various parasitic and saprophytic species of bacteria.**—*Ann. of Appl. Biol.*, xvi, 4, pp. 567–577, 2 figs., 1929.

The author briefly describes experiments with 14 species of bacteria, including *Bacterium tumefaciens*, *Bacillus solanisaprus*, and *B. phytophthorus*, which showed that the fresh juice of potato tubers possesses an agglutinating and plasmolytic action on certain of them. The agglutinating power is due to substances which are precipitated by 95 per cent. alcohol, and is independent of any previous inoculation of the potato with bacteria, while the plasmolytic power is gradually lost on exposure of the juice to the

air. The agglutinating power of the potato juice precipitate for any one of the species varied with the H-ion concentration of the solution, and each species remained unaffected at one definite P_H value, which, in the case of *B. solanisaprus* and *B. phytophthorus*, was found to be approximately that of the potato sap itself, i. e., about 6·2. The twelve species non-pathogenic to potato tested had non-agglutination points above or below this, that of *Bact. tumefaciens* being 5·6.

BERRIDGE (EMILY M.). **Studies in bacteriosis. XVII. Acidic relations between the crown-gall organism and its host.**—*Ann. of Appl. Biol.*, xvii, 2, pp. 280–283, 3 figs., 1930.

Details are given of experiments which showed that the H-ion concentration in meristematic tissues of tumours caused on tomato and Paris daisy (*Chrysanthemum frutescens*) by *Bacterium tumefaciens* is about P_H 5·2, i. e., about the same as she showed in a previous paper [see preceding abstract] to be the most favourable for the growth of the organism in the presence of some constituents of potato sap. The investigation also supplied a suggestion that the process of tumour formation is due to healing reactions similar to those which occur in wounded plant tissue [see below, p. 735].

ISRAILSKY (W. P.) & STARYGIN (LYDIA). **Die Dissoziation bei einigen Bakterienarten.** [Dissociation in some species of bacteria.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxi, 1–7, pp. 1–11, 13 figs., 1930.

The authors investigated the phenomenon of dissociation (resulting in the production of two distinct strains, one smooth and the other rugose) in *B*[*acillus*] *radiobacter*, *B. radicicola*, and various strains of *B*[*acterium*] *tumefaciens* [*R.A.M.*, ix, p. 232]. In addition to the development of smooth and rugose colonies, dissociation was further manifested by modification of certain biochemical characters, especially the absence of the typical pale serum zone in milk cultures of the rugose strains and the varying degree of acid formation from dextrose, dextrin, and galactose.

WATERHOUSE (W. L.). **Australian rust studies. II. Biometrical studies of the morphology of spore forms.**—*Proc. Linn. Soc. New South Wales*, lv, 2, pp. 159–178, 1 pl., 1930.

In continuation of his investigation of Australian cereal rusts [*R.A.M.*, ix, p. 438], the author gives details of measurements of the spores of the different stages of the rusts, made in an attempt to identify the various physiological forms by a biometrical study of their spores. A comparison of the aecidiospores of two physiological forms of *Puccinia graminis tritici* and one form of *P. graminis avenae* showed that the spores of the latter are significantly longer and also probably significantly wider than those of the former. The uredospores of the 13 physiological forms of *P. graminis tritici* studied showed significant morphological differences, and there was evidence of parallelism between the morphological and physiological characters of two groups, each including three forms occurring naturally in Australia; the fact, however, that form 34, which morphologically belongs to one of

these groups, entirely differs from it in its behaviour on differential hosts, indicates that such a parallelism does not necessarily exist in every case. Uredospores of the so-called 'new form', which was produced on barberry as a hybrid form, were unique in their dimensions.

Similar differences were also noted in the dimensions of the uredospores of the five physiological forms of *P. graminis avenae* and two forms of *P. triticina* investigated. Further, morphological differences were also noticed in the teleutospores of the various rusts, but no correlation was found between these and uredospores of the same forms.

HARRINGTON (J. B.). **The relationship between morphologic characters and rust resistance in a cross between Emmer (Triticum dicoccum) and common Wheat (Triticum vulgare).**—*Canadian Journ. of Res.*, ii, 5, pp. 295–311, 1 pl., 1930.

A study of morphological characters of wheat in relation to its field resistance to black stem rust (*Puccinia graminis tritici*) was made on the cross Vernal (*Triticum dicoccum*) × Marquis (*T. vulgare*) [*R.A.M.*, ix, p. 95]. Fifteen morphological characters were used, including spike form, spike compactness, stem hollowness, rachis articulation, rachis width, spikelet adherence, glume adherence, keel sharpness, and seed character, all of which are of importance in the differentiation of species. A random group of 276 F_2 plants showed no marked correlation between rust reaction and other characters, the most significant coefficients ranging from 0·13 to 0·27. No close relationships were found, moreover, between any two morphological characters, the highest correlation coefficient obtained being 0·37. In the entire F_2 population of 21,480 plants there were 232 *vulgare*-like hybrids showing the high rust resistance of Vernal, although Marquis wheat grown as a control developed a fairly uniform infection of moderate severity. All these hybrids proved to be of the *vulgare* or near the *vulgare* type in almost all characters, especially those of economic importance, viz., spike form, rachis articulation, spikelet adherence, and glume adherence. It is evident, therefore, that a high degree of rust resistance can be transferred from *dicoccum* to a *vulgare*-type wheat without great difficulty, the attainment of desirable combinations of emmer rust resistance with the important morphological characters of *vulgare* depending primarily on the availability of a population of many thousands of individuals for selective purposes.

BENSAUDE (MATHILDE). **A alforra negra dos cereaes.** [Black rust of cereals.]—*Actualidades Biol.*, ii, pp. 229–277, 12 figs., 1930.

After a full account of the biology of *Puccinia graminis*, with notes on the history, symptoms, and epidemiology of black rust of wheat, the author states that observations made since March, 1927, at Belém, Portugal, showed that under very different meteorological conditions the first uredosori appeared on 10th May, 1927, 15th May, 1928, and between 30th April and 17th May in 1929,

when infection was rare. In 1927 and 1928 after harvest time the author failed to find any living uredospores of *P. graminis* on volunteer cereals and Gramineae in this locality, though in August and September of both years dead uredospores, probably killed by the extreme heat that prevailed earlier, were seen on wild oats. In October, 1928, at Sintra, near a field of wheat severely rusted during the summer, many *Puccinia* spp. were found on various Gramineae, but *P. graminis* was present on wild oats only, and had then lost its germinative capacity.

Attempts to obtain rusted wheat by sowing the susceptible variety Português in September failed even when the plants were kept under humid conditions, for 48 hours at a time, on various dates in October and November. At the end of February, however, *P. triticina* appeared on some of the wheat. As this indicated that conditions favourable to rust development prevailed, a pot of wheat plants covered with the uredosori of *P. graminis* was placed in proximity to the bed of Português wheat. A fortnight later the plants, which had been neither watered nor covered up, showed numerous pustules of *P. graminis*. The normal appearance of black rust in May only is therefore attributed to lack of natural inoculum earlier in the year.

It is probable that in the vicinity of Lisbon and in the low-lying parts of Portugal the uredospores of *P. graminis* are unable to withstand the summer heat and are to be found during summer only in the mountains [cf. *R.A.M.*, viii, p. 490]. Spring epidemics, it is thought, may be due to sporidia from barberry bushes (*Berberis vulgaris*), which come into foliage in April, or the fungus during summer and winter may be present on Gramineae without producing aecidiospores on barberry. As barberry bushes are exceedingly uncommon in Portugal, where only *B. vulgaris* is known, the latter view is considered to be the more probable. Infection, however, may originate by the agency of spores blown from barberry bushes in neighbouring parts of Spain.

Notes are given on control by improved cultural practices designed especially to accelerate ripening, and the use of fungicides and resistant varieties.

LINDFORS (T.). **Till vapen mot Berberisbusken!** [To arms against the Barberry bush!]—*Landtmannen*, xiii, 20, pp. 424–425, 1 fig., 1930.

Referring to the ravages caused by stem rust of wheat [*Puccinia graminis*] in the Lake Maelar district of Sweden in 1929 [*R.A.M.*, ix, p. 98], the writer again urges the necessity of barberry eradication. In cases where the mechanical uprooting of the bushes or the ordinary salt treatment are impracticable, a 5 per cent. solution of sodium chlorate may be used to spray the barberries. The operations should be conducted when the bushes are in full leaf, employing a Bill, Holder, or Pomonax spraying apparatus.

STEINER (H. E.). **Die Saugkraft, ein Merkmal zur Charakterisierung der Braunrostbiotypen.** [Osmotic force as an index to the characterization of brown rust biotypes.]—*Phytopath. Zeitschr.*, ii, 3, pp. 199–208, 1 map, 1930.

The results [which are discussed and tabulated] of experiments

conducted at the College of Soil Culture, Vienna, to determine whether the osmotic force of the uredospores of the biotypes of brown rust of wheat (*Puccinia triticina*) recently investigated in Germany by Scheibe [*R.A.M.*, ix, p. 635] could be used to differentiate the various forms instead of the more cumbrous method of inoculations on differential hosts, gave promising results. The method employed was to determine the concentration of cane sugar solution which permitted germination of 50 per cent. of the spores capable of germinating in water, and was thus, in principle, the same as that employed by Zederbauer for osmotic measurements in higher plants. It was found that this factor varies considerably according to the place of origin of the biotypes, but as the latter occur in definite climatic zones, their differentiation is possible. Thus form XIII, which possesses the highest degree of osmotic force (50 per cent. germination at 0·45 of a normal (volume-molar) solution) is almost uniformly distributed in regions with an average annual rainfall of 500 to 600 mm. (Finland and north-west Germany), while XI and XIV, with lower osmotic force (0·40 and 0·30 per cent., respectively) occur mainly in localities with a mean annual precipitation of 600 to 700 mm. (south and south-west of Germany). In the writer's opinion, the osmotic force of the uredospores is a valuable supplement to artificial inoculation tests, and may even replace the latter, in the differentiation of the biotypes of *P. triticina*.

Dillon Weston (W. A. R.). **Observations during 1927–28 on the incidence of 'rusts' on various selected Wheat varieties, with special reference to the intensity of yellow rust, Puccinia glumarum, Eriks. and Henn.**—*Ann. of Appl. Biol.*, xvi, 4, pp. 533–541, 1929.

This is a brief report of observations in 1927–8 on the incidence of yellow, brown, and black rusts (*Puccinia glumarum*, *P. triticina*, and *P. graminis*, respectively) on a large range of English, Australian, and American varieties of wheat grown at the Cambridge University Farm for the purpose of testing their resistance to bunt (*Tilletia caries*) [*R.A.M.*, ix, p. 27]. Notes on the comparative intensity of yellow rust on these varieties indicated that infection with bunt increases the susceptibility of the host to this rust [ibid., vi, p. 344], a fact which suggests that in resistance tests of wheat varieties to *P. glumarum* the seed should be previously inoculated with bunt spores, and that a variety should be regarded as truly resistant to the rust only if the latter failed to appear under such conditions in the resulting crop.

Evidence is also given that the 24 chromosome group of wheats cannot be generally considered to be more resistant to pathogens than the 42 chromosome group [cf. ibid., iii, p. 200], or that species and varieties of wheat resistant to rust are also resistant to bunt and vice versa.

Schlumberger [O.]. **Ein Beitrag zur Statistik der Getreidebeizung.** [A contribution to the statistics of seed-grain disinfection.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 5, pp. 33–35, 1930.

From information supplied by the seed-grain section of the German

Agricultural Society, it appears that roughly 33,300 doppelzentner or 87·29 per cent. of the total quantity necessary for sowing the 31,774 hect. for which statistics were available, were treated by disinfectants during 1929. The relative shares of the different methods of treatment were as follows: liquid (chiefly germisan) 66·66 per cent.; dusting (principally tillantin) 21·89; and hot water (with or without germisan or uspulun) 5·91 per cent.

HILGENDORFF [G.]. **Über die Bestimmung des Beizbelages an trockengebeiztem Getreide.** [On the determination of the degree of incrustation of the disinfectant on dusted seed-grain.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 5, pp. 33, 1930.

The writer has devised the following method for the chemico-analytical determination of the heaviness of the coating produced by dusts (represented by tillantin in these investigations, but stated to be equally applicable to tutan, copper carbonate, and the like) on seed-grain treated in different apparatus [cf. *R.A.M.*, viii, p. 31]. The dusted seed is repeatedly shaken up with ether to remove the disinfectant, which is recovered by evaporation. The residue is dissolved in dilute acetic acid, the arsenic oxidized by bromine water and the copper content determined by titration with sodium thiosulphate after the addition of potassium iodide. The amount of disinfectant adhering to the seed-grain may then be readily deduced provided that the copper content of the preparation is known. In a calculation of the final value it should be remembered that the method only accounts for 95 per cent. of the disinfectant adhering to the seed-grain.

HILTNER (E.). **Feldversuche über die Wirkung verschiedener Beizmittel auf Steinbrandbefall und Ertrag des Weizens.** [Field experiments on the effect of various disinfectants on the incidence of bunt and yield of Wheat.]—*Fortschr. der Landw.*, v, 13, pp. 447–450, 1930.

The results [which are tabulated and discussed] of the writer's experiments in the control of wheat bunt [*Tilletia caries* and *T. foetens*] at the Bavarian Agricultural and Plant Protection Institute demonstrated the efficacy of germisan and weizénfusariol at varying concentrations (sprinkling, immersion, and short disinfection process) for this purpose [*R.A.M.*, ix, p. 168]. Abavit and tillantin dusts (150 gm. per cwt.) were also effective; 844, a dust of similar composition to fusariol, gave good control of bunt, and is further stated to be efficacious against *Fusarium* but unsatisfactory against loose smut of oats [*Ustilago avenae*] and stripe disease of barley [*Helminthosporium gramineum*].

The average increases of yield in the Mauerner Dickkopf variety obtained from all treatments during the three-year period of the experiments was 2·6 to 8·3 per cent. of grain and 0·1 to 14·4 per cent. of straw. A test to determine the response of different varieties to disinfection showed that Moosburger Dickkopf, Criewener 104, and Pflug's Baltikum always reacted favourably as regards increase of yield during the three-year period 1924–7. Mauerner Dickkopf almost always benefited more by sprinkling

than by immersion, while the reverse held good for Pflug's Baltikum and Criewener 104. The average increase of grain for all 14 varieties from treatment with weizenfusariol (during the three-year period) and sublimoform (1925–6 only) was 0·4 to 3·8 per cent.

GREVEL (F. K.). **Untersuchungen über das Vorhandensein biologischer Rassen des Flugbrandes des Weizens (Ustilago tritici).** [Investigations on the occurrence of biological strains of the loose smut of Wheat (*Ustilago tritici*).]—*Phytopath. Zeitschr.*, ii, 3, pp. 209–234, 1 fig., 2 diags., 1 map, 1930.

The writer's investigations [the results of which are fully discussed and tabulated] have shown that loose smut of wheat (*Ustilago tritici*) comprises at least four biological strains [*R.A.M.*, vii, p. 435], viz., I (the common German loose smut), attacking in increasing order of severity the Heine's Kolben, Hohenheimer 25f, and Rimpau's Roter Schlanstedter varieties but only slightly, or not at all, the Grüne Dame and Peragis; II the loose smut of the Grüne Dame variety group, which causes heavy infection on Grüne Dame and Peragis but little or no damage to Hohenheimer 25f and Roter Schlanstedter; III the loose smut of the 368_{20} strain, attacking Grüne Dame and Peragis as well as Hohenheimer 25f and Roter Schlanstedter with great severity. Medium infection of Heine's Kolben is a common feature of these three strains. Among the 29 non-German collections tested (both European and extra-European), there was only one which proved to be distinct from all three of the above-mentioned strains, and may be designated strain IV : this is the Turkish loose smut from Adana and Konia (in which a Japanese strain may also be included). All the *vulgare* wheats tested proved immune from, or highly resistant to, this strain. It is apparent from these data that the composition of a loose smut population is not affected by geographical origin but depends on the variety on which the fungus develops. Heine's Kolben occupies an exceptional position in this respect since, as shown above, it is attacked to a moderate extent by all the three German strains, and therefore does not influence the composition of the populations.

Piekenbrock's conclusion that resistance to loose smut is a Mendelian factor, inherited on a recessive basis [loc. cit.], was confirmed by the writer's investigations. Each of the two crosses tested (Grüne Dame × Roter Schlandstedter and Grüne Dame × Rümker's Sommerdickkopf) was found to yield a strain manifesting immunity from biotypes I and II, and thus affording an example of successful hybridization for breeding purposes which should be extended on a wide scale.

RUSSELL (R. C.). **Field studies of take-all in Saskatchewan.**—*Scient. Agric.*, x, 10, pp. 654–668, 4 figs., 1 map, 1 chart, 1930.

Take-all of wheat (*Ophiobolus graminis*) was first reported in Canada from Saskatchewan in 1923 [*R.A.M.*, iii, p. 442], and is now known to be of common occurrence in certain districts throughout the Prairie Provinces. The causal organism is believed to be indigenous to Western Canada. The disease occurs mainly

in the semi-wooded areas, and may be of considerable economic importance especially during relatively wet seasons between 1st June and mid-August and on comparatively new land which is being cropped continuously to wheat. Systematic field surveys conducted annually from 1924 to 1929 have indicated that the disease may be satisfactorily controlled by simple crop rotation [the methods of which are concisely outlined].

TASUGI (H.). **On the pathogenicity of Typhula graminum, Karsten.**—*Journ. Imper. Agric. Exper. Stat.*, Nishigahara, Tokyo, i, 3, pp. 183–198, 2 pl., 1930. [Japanese, with English summary.]

Continuing his studies on the snow rot fungus (*Typhula graminum*) [*R.A.M.*, ix, pp. 29, 644], the writer carried out a series of inoculation experiments (using L. J. Stakman's method [ibid., iii, p. 82] and a modification of this technique) on young barley and wheat plants.

At first the hyphae grew adpressed to the surface of the inoculated portion of the plants, subsequently traversing the cell walls and penetrating the tissues, causing the death and decay of the latter. In the early stage of infection, the affected roots turned yellowish-brown, later merging into brown and finally into blackish-brown. The diseased aerial organs first became yellowish, then brown, and eventually greyish-brown.

Infection by *T. graminum* is most severe under cold and damp conditions, especially in plants immersed in water. With the advent of warmer weather the progress of the fungus is arrested and the plants gradually recover their growing power, producing vigorous new rootlets.

Six strains of the fungus isolated from hulled barley (two), naked barley, wheat, *Eleusine indica*, and *Alopecurus fulvus* showed no significant differences in their mode of infecting hulled and naked barley and wheat. The hulled and naked barleys were found to be equally susceptible to infection by *T. graminum*, while wheat is more resistant.

It would appear from the author's investigations that snow is not actually necessary for infection by *T. graminum*, the development of which, however, is undoubtedly favoured by the low temperature and moisture under a snow cover.

MOREAU (F.). **Sur une maladie des Blés en herbe.** [On a disease of growing Wheats.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 5–6, pp. 236–239, 1 fig., 1930.

A brief account is given of a disease which was observed in the early spring of 1930 on a winter wheat (Blé de la Paix) in central France, the main symptoms of which were a yellow discoloration of the leaf sheaths and a longitudinal shredding of the sheaths and leaf blades, closely resembling the condition caused in barley by species of *Helminthosporium*. Occasionally large black spots appeared on the leaves, due to the development of a hyaline, septate mycelium bearing brownish or blackish stromata with conidiophores and conidia. The conidiophores are grouped in tufts, chiefly along the veins; they are simple, irregular, brownish,

occasionally hyaline at the apex, and produce single (rarely several) conidia which are soon abstricted. The conidia are light brown, elongated, straight, usually one- but frequently three-septate (rarely continuous or two-septate, and very occasionally muriform), and measure 18 to 24 by 7 to 10 μ. In water they germinated by the production at one or both ends of a hyaline germ-tube, but were never seen to bud. The fungus is referred to *Cladosporium herbarum*, and the presence in it of pluriseptate and muriform spores is considered to establish a link between the genera *Cladosporium*, *Helminthosporium*, and *Macrosporium*.

Although the pathogenicity of the fungus was not experimentally proved, it is believed that it was responsible for the diseased condition of the wheat, and the fact that the seed had been disinfected by steeping in copper sulphate previous to sowing indicates that seed was not the source of infection.

BENSAUDE (MATHILDE). **L'Helminthosporium tetramera McK. sur Blé à Angola.** [*Helminthosporium tetramera* McK. on Wheat in Angola.]—*Comptes rendus Soc. de Biol.*, ciii, 14, pp. 1265–1266, 1930.

In 1929 the writer examined some 'gigantil' wheat seedlings from the plateau of Angola (Portuguese East Africa), suffering from a disease of the root system which was reported to have destroyed 20 to 30 per cent. of the stand. Two fungi developed on plants placed in a moist chamber, viz., a species of *Fusarium* and a species of *Helminthosporium* with long, olive-brown conidiophores bearing numerous oval, triseptate conidia measuring 18 to 32·4 by 7·2 to 13·6 μ (mostly 25 to 28·2 by 9 to 12·2 μ), and thus closely resembling *H. tetramera* McKinney collected on wheat in Oklahoma [*R.A.M.*, v, p. 223], the conidia of which measure 20·4 to 40·8 by 8·5 to 20·4 μ (mostly 30·6 to 34 by 10·2 to 13·6 μ). Inoculation experiments with the African strain of *H. tetramera* gave consistently negative results.

FUCHS (W.). **Eine neue Methode zur künstlichen Infektion der Gerste mit Helminthosporium gramineum Rbh. und ihre Anwendung zur Prüfung von Beiz- und Immunitätsfragen.** [A new method for the artificial inoculation of Barley with *Helminthosporium gramineum* Rbh. and its application to the investigation of disinfection and immunity problems.]—*Phytopath. Zeitschr.*, ii, 3, pp. 235–256, 1930.

Natural infection of barley with stripe disease (*Helminthosporium gramineum*) being very irregular and uncertain, the writer has devised a simple method of artificial inoculation [full details of which are given] consisting in the injection of a conidial suspension of the fungus into the ripe grains after soaking the latter for an hour or two in water so as to loosen the glumes from the grain and permit of inserting the needle between them. This process, however, though preferable to the tedious method of blossom inoculation [*R.A.M.*, viii, p. 231], is inadequate for the production of large quantities of inoculum for field tests, which can be obtained as follows. The barley grains are placed in a vacuum for 20 minutes in a conidial suspension of the fungus, in

such a way that the air between the glume and the seed, especially over the embryo, is removed, and when the pressure is again restored the conidial suspension penetrates with great impetus between the glume and seed. In order to produce abundant mycelium between the glume and seed, especially in the embryonal region, the treated grains must be stored for two days in an incubator at a temperature of 25° to 28° C. and an atmospheric humidity of 90 to 100 per cent. They are then spread out to dry. Plants grown from seed-grain treated in this manner show the typical symptoms of stripe as induced by natural infection. A barley straw decoction or dextrose solution proved to be satisfactory media for the production of conidial suspensions.

The efficiency of the mass infection method was demonstrated by two years' disinfection and susceptibility experiments; the results of the latter were in complete agreement with those obtained by Genau with blossom-infected material [loc. cit.]. The best control of stripe disease in artificially infected barley was given by germisan (liquid) and uspulun-universal (both at the rate of 0·25 per cent., 30 minutes' immersion for the former and one hour for the latter); the dusts tillantin and tutan were less effective. The removal of the glumes from artificially or naturally infected grains neither increased nor reduced the incidence of stripe disease.

Reddy (C. S.) & Burnett (L. C.). **Development of seed treatments for the control of Barley stripe.**—*Phytopath.*, xx, 5, pp. 367–390, 2 graphs, 1930.

In 1928 the most effective control of barley stripe (*Helminthosporium gramineum*) in the Minsturdi variety, and the largest increases in acre yields were given by treatment with Bar 1 and Bar 3. Bar 1 consisted of 2·7 gm. $HgCl_2$ in solution, to which sufficient NaOH solution was added to change the mercury to the yellow oxide. The supernatant liquid was decanted and the yellow oxide triturated with 2 gm. $NaHSO_3$; after the addition of 22·3 gm. talc, it was thoroughly mixed, air-dried, and pulverized. Bar 3 was composed of 6 gm. $NaHCO_3$, 6 gm. $NaHSO_3$, 8 gm. $HgCl_2$, and 80 gm. talc. Increased yields were also given by the PIC treatment (10 gm. $HgCl_2$ and 5 c.c. cresol triturated in a mortar, sufficient NaOH solution added to produce a thick, yellow mass, with an admixture of strong copper sulphate in excess of the reaction, and 90 gm. talc). The yield increases from these three treatments ranged from 5·9 to to 15·1 bushels per acre (13·8 to 54·5 per cent.). In other tests Bar 4 (3 gm. $HgCl_2$, 10 gm. $NaHSO_3$, and 87 gm. talc) was also effective, increasing the yields by 21·2 and 18·6 per cent. at Ames and Mason City, Iowa, respectively, in 1929. In the same year ceresan gave very satisfactory control of stripe [*R.A.M.*, viii, p. 372], the incidence of which was reduced from 17·9 and 16·3 per cent. at Ames and Mason City, respectively, to 0·25 per cent. in both places, with increased yields of 15.2 and 18·7 per cent.

Data on the occurrence of stripe in 18 barley varieties from seed grown in a single field the preceding year indicate that Minsturdi and Oderbrucker (Wis. 5–1) are very susceptible, while Trebi,

Spartan, Nepal, and Black Hull-less are resistant. In these tests ceresan, Bar 3, and Bar 4 (in the order named) gave the best control of stripe. Certain varieties, e.g., Wis. Barbless, Sandrel, and Hero, were found to be injured by seed treatment with these preparations, the damage being reflected in decreased yields. On the whole, ceresan is considered to have given the most satisfactory results in these tests, and it can probably be used with safety on nearly all the common varieties.

EDDINS (A. H.). **Dry rot of Corn caused by Diplodia macrospora Earle.**—*Phytopath.*, xx, 5, pp. 439–447, 3 figs., 1 graph, 1930.

Of the three dry rots of maize occurring in Florida, viz., *Diplodia macrospora* [*R.A.M.*, vii, p. 711], *D. zeae* [ibid., ix, p. 299], and *D. frumenti* Ell. et Ev. [ibid., ix, p. 375], the first-named ranks second in economic importance, the heaviest losses in 1928 and 1929 being caused by *D. zeae*.

Maize ears severely infected by *D. macrospora* are shrunken, shrivelled, and tightly clasped by the husks; the white mycelium of the fungus is visible on the grey, lustreless kernels and between the kernel rows, while pycnidia may occur on the sides and tips of the kernels, on the husks, and on the shank. In many cases only the butt end of the ear is diseased. Infected areas on the leaf sheaths and blades appear water soaked to yellowish at first, then brown. The lesions on the blade are irregularly elongated and may coalesce to form dead spots two inches long and half-an-inch wide, usually bearing a few scattered pycnidia. The stalk may be attacked at any node or internode, the lower part being most often involved and rotted.

The carbonaceous, flask-shaped pycnidia of *D. macrospora*, measuring 150 to 450 μ, are embedded in stromatic masses of mycelium and in the host tissue, becoming erumpent at maturity. The light brown, cylindrical to clavate, slighty curved or straight, uni-, bi-, tri-, or quadricellular pycnospores (usually bicellular), measuring 43 to 95 by 6 to 13 μ, mostly 60 to 75 by 8 to 10 μ (average 67·8 by 9 μ), are borne on short, hyaline conidiophores. Each of the cells may form a germ-tube.

The symptoms produced by *D. zeae* are similar to those of *D. macrospora*. *D. frumenti*, on the other hand, causes a blackening of the kernels, which are often covered with a dark brown to black mould. Furthermore, the pycnidia of this fungus appear in clumps on the stalk and emerge through longitudinal cracks in the epidermis instead of occurring singly and rupturing the epidermis only at the point of emergence, as in the case of *D. zeae* and *D. macrospora*.

The three species differ morphologically. The mycelium of *D. frumenti* is brown instead of hyaline as in *D. zeae* and *D. macrospora*, and the bicellular spores are elliptical, dark brown, and measure 19 to 31 by 11 to 15 μ (average 25·3 by 13·3 μ). The spores of *D. macrospora* are cylindrical to club-shaped and two to three times as long and about twice as wide as those of *D. zeae*, which measure 17 to 33 by 3 to 7 μ (average 23·8 by 5·3 μ). The spores of *D. zeae* may have two septa and those of *D. macrospora* up to three, both being light brown.

The optimum temperature for the germination of the spores of *D. macrospora* was found to range from 25° to 32°, with a maximum between 35° and 39°, and a minimum between 5° and 8°. These points correspond closely with those determined by Durrell for *D. zeae* [ibid., iii. p. 207]. *D. macrospora* developed best at a hydrogen-ion concentration between P_H 3·7 and 5·9; no growth occurred at P_H 2 and little at 8·5.

The results of inoculation experiments [which are briefly described] showed that *D. macrospora* enters the ears through exposed tips and wounds and by growing up through the shanks. Seedlings grown in sand inoculated with a pure culture of the fungus also contracted the disease. The infected roots were shrunken and light brown and the tops of the plants either wilted or dead. The fungus hibernates as dormant mycelium in the seed, in old plant débris, and in the soil. Its longevity beyond one year has not been determined, but it is thought to be probably capable, like *D. zeae*, of living for several years under these conditions.

H[OPKINS] (J. C.) [F.]. **The Diplodia menace.**—*Rhodesia Agric. Journ.*, xxvii, 5, pp. 502–504, 1930.

In Southern Rhodesia the losses caused by dry rot of maize (*Diplodia*) [*zeae*: *R.A.M.*, ix, p. 119] are estimated at not less than 15 per cent. of the crop, which, calculated at the rate of 10*s.* per bag, is equivalent to an annual loss to the Rhodesian maize industry of approximately £100,000.

Experiments with representative samples of commercial seed showed that as much as 30 per cent. of any sample may be infected, while in pot trials the stand was sometimes as low as 55 per cent. of the normal.

Improved field sanitation is regarded as essential for the control of dry rot; there appears to be little hope of diminishing the disease so long as the trash and stalks are left about undestroyed on the farm from season to season.

STAKMAN (E. C.), CHRISTENSEN (J. J.), EIDE (C. J.), & PETURSON (B.). **Mutation and hybridization in Ustilago zeae.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 65, 108 pp., 13 pl., 4 figs., 3 graphs, 1929. [Received September, 1930.]

From the investigations described in the first part of this paper, which is by all the authors conjointly, and deals with mutation in *Ustilago zeae* [cf. *R.A.M.*, ix, p. 237], it is concluded that this fungus comprises an indefinite number of monosporidial or haploid lines differing in so many physiologic characters that they might well be considered physiologic forms. Numerous sectors arose in cultures of most monosporidial lines of *U. zeae*, and 'patch mutants' also occurred occasionally. They differed from the parents in rate of growth, size, consistency, colour, elevation, and surface characters, as well as in enzymic activity, reduction of nitrates and iodine, and sometimes in sporidial morphology. From one line the authors isolated within a year 220 mutants, 162 of which were different, while from another line only 70 mutants were obtained.

A few lines were never observed to mutate, while others began to mutate only after long growth in culture.

The fusion of lines of opposite sex was usually necessary before infection of the host took place, but pathogenicity is not a sexual function only, for certain lines may unite to form smut spores without producing large galls, while others may produce them.

Cases were noted in which the mutants appeared to have lost their sex factors and became unable to unite with other lines, or to have lost factors for pathogenicity, while others seemed to have greater virulence than the immediate parent.

The rate of mutation was apparently affected both by nutrients and temperature; the largest number of mutants appeared at fairly high temperatures.

The sectors or patches are believed to be true mutations resulting from genotypic changes, since they arose in monosporidial lines, which appeared to be haploid clones; the new characters persisted through asexual propagation, and evidence was obtained that some persisted through sexual fusions.

In the second part of the paper, describing investigations on hybridization in *U. zeae* [cf. ibid., viii, p. 715] by Christensen, it is stated that monosporidial lines from various parts of the world produced smut galls when paired with one or other of two monosporidial lines of opposite sex isolated from smut spores from Minnesota; no evidence was obtained of complete interfertility or intersterility between possible 'geographic strains'.

Smut spores were obtained from six different crosses of monosporidial lines, including some mutants; 102 sporidia (F_1 gametes) were isolated from these crosses and the resulting monosporidial (F_1) lines were studied in detail. It was found that multiple factors are present in *U. zeae* for rate and type of growth, colour, consistency, and topography of colonies, and, possibly, for the tendency to mutate. Thirty-two F_1 lines isolated from smut spores in a single gall, resulting from crossing two monosporidial lines, differed culturally from each other. Sex and pathogenicity also appeared to be governed by multiple factors. Dikaryophytes resulting from pairing F_1 lines from a single cross differed widely in their pathogenicity.

Three monosporidial lines obtained by isolating F_1 gametes from a cross caused normal infection when inoculated singly into maize, though they differed in virulence; 29 other lines, however, from the same cross did not produce infection when so inoculated.

STELL (F.). **Notes on the diseases of Coconuts in Trinidad and Tobago.**—8 pp., 5 pl., *Dept. of Agric., Trinidad and Tobago*, 1930.

Brief popular notes are given on the causal organisms, symptoms, and control of the chief diseases of coco-nut in Trinidad and Tobago, including bud rot (*Phytophthora*) [*palmivora*], red ring (due to the nematode *Aphelenchus cocophilus*), bleeding stem (*Thielaviopsis*) [*Ceratostomella paradoxa*], and the non-parasitic diseases little leaf [*R.A.M.*, viii, p. 356], wilt [ibid., ix, p. 238], and lightning-strike. The typical diagnostic characters of these conditions are listed.

Wallace (G. B.). **A Coffee-bean disease.**—*Trop. Agriculture*, vii, 5, p. 141, 1930.

In the beans of green and red coffee cherries growing in Tanganyika and affected with a disease commonly attributed to the coffee bug (*Antestia lineaticollis*), the author invariably found a *Nematospora* [cf. *R.A.M.*, v, p. 389], the available evidence pointing to the insect as the vector. The disease is very destructive, up to 95 per cent. of the beans in ripe cherries being killed. Further investigations are in progress.

Lewis (I. M.). **The inhibition of Phytomonas malvaceara in culture media containing sugars.**—*Journ. of Bact.*, xix, 6, pp. 423–433, 1930.

Fourteen strains of *Phytomonas malvaceara* [*Bacterium malvacearum*: *R.A.M.*, ix, p. 452], freshly isolated from diseased cotton leaves in Texas, failed to grow in culture media containing any of the sugars glucose, maltose, lactose, galactose, or levulose, with various nitrogenous compounds, when sterilized at 122° C. for 15 minutes. This failure of growth was found to be due, not to incapacity to assimilate the various sugars, but to chemical changes caused by the high temperature of sterilization. It was not apparent at a concentration below 0·4 per cent. glucose in a solution containing also 0·1 per cent. peptone and 0·5 per cent. dibasic potassium phosphate, whereas above 0·6 per cent. no growth occurred. Similarly, growth was inhibited by the presence in the medium of more than 0·2 per cent. phosphate. The inhibitory substance appears to be produced by specific reactions between glucose, a nitrogen compound, and phosphate in alkaline media under suitable temperature conditions.

Zaprometoff (N. G.). Мучнистая роса Хлопчатника. [Powdery mildew of Cotton.]—*Хлопковое Дело* [*Cotton Industry*], *1930*, Tashkent, 1, pp. 143–145, 2 figs., 1930.

The author states that in August, 1929, powdery mildew was recorded for the first time in Russian Central Asia on a bush each of the Egyptian cotton variety Nubari and of the American Upland variety Triumph Navrotzky. Macroscopically the disease is very similar to the West Indian cotton mildew (*Ovulariopsis gossypii*) in St. Vincent [*R.A.M.*, vii, p. 618], but the spots bear both conidia and perithecia and the fungus is identified as a new form of *Leveillula* [*Oidiopsis*] *taurica*, which is named *L.* [*O.*] *taurica* f. *gossypii*. The conidia are formed singly on conidiophores of the *Oidiopsis* type; they are hyaline, ellipsoid-cylindrical, and 43 to 50 by 13·2 μ in diameter. The perithecia are black, immersed in the mycelial mat covering the spots, globular, 157 to 175 μ in diameter, and are supplied on their lower surface with numerous hyaline, intertwining appendages up to 3 μ broad. The perithecia contain up to 14 asci, 76 to 80 by 23 to 33 μ, each with two ascospores measuring 25·5 to 29·7 by 16·5 μ.

The diseased cotton plants were growing in close proximity to weeds (*Zygophyllum fabago* and *Alhagi camelorum*) abundantly infected with *O. taurica*, a fact which suggests the possibility that

the outbreak on cotton may either have been a casual sub-infection or may mark the first stage in the mutation of the parasite to adapt itself to a new host.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **Recent studies on Phymatotrichum root rot.**—*Amer. Journ. of Botany*, xvii, 6, pp. 554–571, 1 pl., 3 figs., 1 map, 1930.

Some outstanding features of the recent investigations on cotton root rot (*Phymatotrichum omnivorum*) in Texas [*R.A.M.*, ix, p. 380] are summarized and discussed.

The disease has been found to attack at least 274 species of cultivated plants, including a number of economic importance, while it also occurs on some 244 other species [ibid., ix, p. 241]. The aggregate annual loss from root rot in Texas is estimated at about $100,000,000. Cross-inoculation experiments between various hosts have given positive results.

The conidial (*Phymatotrichum*) stage of the fungus is found on the surface of the ground above infected roots, which may be decayed (as in the case of lucerne and jujube [*Zizyphus jujuba*]) to a depth of 8 ft., and has been microscopically shown to be connected with the vegetative *Ozonium* strands on the roots. The conidia germinate sparingly, and are not known to cause infection. Sclerotia and dormant hyphae have been found in the soil, and cotton has been successfully inoculated with the former. Infection continues to spread on the roots during the winter, although there are no aerial symptoms of wilting.

Root rot was not transmitted by soil taken from active zones of diseased patches and inoculated into healthy plants. The disease further failed to attack plants grown in root rot patches but sifted to remove the roots, while it did occur in control containers filled with unsifted soil. Excavation studies of cotton plants, and examination of the soil and roots, showed no spread from these points of primary infection through the soil independently of the roots.

In laboratory tests the fungus developed profusely along the walls of glass vessels but penetrated only a few centimetres into the soil. However, in containers loosely filled with Bell clay soil, *P. omnivorum* travelled at least 10 cm. through the soil to the glass wall.

Control measures, including clean culture, rotation with non-susceptible crops, the development of resistant varieties, and soil disinfection, are discussed.

WALLENGREN (H.). **Metarrhizium anisopliae och Pyrausta nubilalis Hb.** [*Metarrhizium anisopliae* and *Pyrausta nubilalis* Hb.].—*Lunds Univ. Årsskr.*, N.F., Avd. 2, xxv, 15, 20 pp., 15 figs., 2 maps, 1929. [German summary.]

Full particulars are given of the author's experiments (forming a part of the International Corn Borer Investigations, Chicago, under the leadership of Dr. T. Ellinger) on the control of *Pyrausta nubilalis* [*R.A.M.*, viii, p. 577] by the fungus *Metarrhizium anisopliae* [ibid., ix, p. 454].

No difficulty was experienced in the inoculation of the larvae of

P. nubilalis with conidial suspensions of *M. anisopliae*; in some cases the insects were simply dusted with the dry conidia. The duration of the disease is comparatively short, the insects generally succumbing after about 12 days at 16° to 19° C. with comparatively slight atmospheric humidity, while at the same temperature in saturated air they lived for only 6 days and at 25° for 4 days. Only 5 of the 105 inoculated insects survived for 26 days, after which all were dead.

A detailed study was made of the mode of penetration by *M. anisopliae*. The penetration into the chitin by the hyphae is accompanied by the development of yellow or brown, usually circular spots, probably due to the secretion of a chitin-dissolving enzyme. It is probable that the hyphae also exert mechanical pressure in their penetration of the chitinous lamellae. The hyphae often grow for a considerable distance between the lamellae before actually entering the body of the insect. Here they develop so rapidly that the mycelium is frequently observed to fill the entire body and permeate all the organs and tissues immediately after the insect's death. Eventually the hyphae emerge through the skin and form grey-green conidia, which may also be present inside the larva. The above-mentioned yellow or dark brown spots on the chitin coalesce and extend over a greater or smaller part of the body. The toxic enzyme secreted by the fungus appears to produce extensive disturbances in the nervous system of the insects ending in complete loss of activity, which is soon followed by death.

Oxer (D. T.). **Mycotic dermatitis in Sheep; and green staining of wool.**—*Tasmanian Journ. of Agric.*, N.S., i, 3, pp. 120–121, 2 figs., 1930.

A brief account is given of the symptoms of the mycotic dermatitis of sheep in Australia, caused by an undetermined fungus [since named *Actinomyces dermatonomus*: cf. *R.A.M.*, ix, p. 310], which is now reported for the first time in Tasmania.

Kyriasides (K. N.). **Die in Griechenland bei Madurafuss (mycetoma pedis) gefundenen Pilzarten.** [The species of fungi associated with Madura foot (mycetoma pedis) in Greece.]—*Arch. für Schiffs- und Tropenhygiene*, xxxiii, p. 656, 1929.

In five of the eight cases of Madura foot hitherto observed in Greece, *Streptothrix* [*Actinomyces*] *madurae* Vincent [*R.A.M.*, ix, p. 603] was identified as the causal organism, while the remaining three are provisionally attributed to *Indiella reynieri* Brumpt. The latter organism is characterized by radiating hyphae, measuring 3 to 5 μ in diameter and terminating in globular or clavate swellings or in bi- to tri-septate chlamydospores; conidia were formed in profusion in bouillon cultures. The best growth was made at 37° C.

Gay (D. M.) & Bigelow (J. B.). **Madura foot due to Monosporium apiospermum in a native American.**—*Amer. Journ. of Path.*, vi, 3, pp. 326–335, 2 pl., 1 fig., 1930.

Full details are given of a case of Madura foot of ten years'

duration in a 33-year-old white American. The fungus isolated from the diseased tissues was characterized by straight or slightly curved, septate, branching hyphae, 2·9 μ in diameter, and brown, thick-walled, oval conidia, borne either on terminal conidiophores or short, narrow, straight sterigmata. It is identified as *Monosporium* (*Scedosporium*) *apiospermum* [*R.A.M.*, vii. p. 171].

Jacobson (H. P.). **Coccidioidal granuloma. A clinical and experimental review with case reports.**—*Arch. of Dermatology*, xxi, 5, pp. 790–817, 12 figs., 1930.

The writer here presents the results of three years' studies on coccidioidal granuloma (*Coccidioides immitis*) in human beings and experimental animals [*R.A.M.*, ix, p. 652]. The aspects of the disease discussed include symptomatology, pathologic histology of the lesions, prevalence, etiology, source of infection and mode of transmission, and treatment. In the writer's opinion, the as yet undiscovered agent of transmission is an insect, feeding on contaminated soil, vegetation, or infected rodents, and conveying the disease to animals and man by means of a sting and deposition of *C. immitis* in the injured skin or mucous membrane. Clinical details are given of 13 cases, and an abstract of the subsequent discussion is appended.

Meriin (J. A.). **Грибок, выделенный из случая хромобластомикоза.** [The fungus isolated from a case of chromoblastomycosis.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 1, pp. 90–100, 10 figs., 1929. [Received September, 1930.]

Isolations from a small, slightly suppurating tumour on the shin of a female adult in Leningrad yielded a fungus which on Sabouraud's medium formed greenish-black to light grey, raised colonies on a black base and with a velvety surface. In liquid media the organism developed a mycelium consisting of yellowish-green hyphae, about 2·6 μ thick, branching at an obtuse angle; oval conidia, 2·6 to 3·9 by 2·6 μ in diameter, formed either directly on the lateral branches or on short, digitiform processes of the latter. In hanging drop cultures, the fructifications were more differentiated, consisting at first of globular conidia in chains gradually decreasing in size towards the distal end; later some hyphae were produced along which oval conidia were formed either singly or in pairs on small globular formations; in some cases the conidia arose in the form of rosettes at the tips of the hyphae. In old cultures on solid media and in hanging drops pseudosclerotia were observed, consisting of densely intertwining, short hyphae bound together by a gelatinous mass. The pathogenicity of the fungus to rats was proved by inoculations.

After noting the morphological, cultural, and pathogenic differences between his fungus and *Trichosporum pedrosoi* [see next abstract], the author considers that it belongs to the genus *Hormodendrum*, and states that it is the first authentic record of a fungus of this genus pathogenic to man in Europe. He suggests for it the name *H. rossicum* Jaczewski et Meriin, n. sp. ad int.

Pozojewa (N. G.). **Ein Fall von Chromoblastomykose.** [A case of chromoblastomycosis.]—*Dermatol. Wochenschr.*, xc, 18, pp. 615–617, 3 figs., 1930.

Notes are given on a case of human chromoblastomycosis, due to *Phialophora verrucosa* [*Trichosporum pedrosoi*: *R.A.M.*, iii. p. 389; viii, p. 646]. examined at the Leningrad Oncological Institute. This case is considered to be of interest on account of the extreme rarity of the disease in Europe, where only one other instance has previously been recorded, by Tschernjawsky (*Arch. für Dermatol.*, clvii, 1929). The fungus has been reported in the tropics among agricultural labourers, and in the case under observation infection occurred on the right foot.

Ball (H. A.). **Human Torula infections—a review. Report of cases.**—*California and Western Med.*, xxxii, 5, pp. 338–346, 8 figs., 1930.

There are 27 known cases of systemic *Torula* infection and four local ones (particulars of which are shown by means of charts, while full clinical details are given of two cases under the author's observation). Infection is stated to be most common in middle life, and the outstanding symptom is severe headache. The disease may simulate tuberculous meningitis, encephalitis, or mental derangement. There are thought to be probably several closely similar organisms causing *Torula* infection, all having a predilection for the central nervous system and giving rise to identical or similar histological symptoms. The atrium of invasion in all cases is probably the upper or lower respiratory tract. It is suggested that the spinal fluid should be microscopically examined in all obscure neurological conditions, especially when accompanied by severe headache.

Wiléńczyk (A.). **Über die Variabilität des Trichophyton violaceum.** [On the variability of *Trichophyton violaceum*.]—*Arch. für Dermatol.*, clxi, 1, pp. 20–23, 4 figs., 1930.

Cultures of *Trichophyton violaceum* subjected to fluctuations of temperature (24° C. and room temperature) assumed an aspect identical with that of *T. granulosum* [*R.A.M.*, ix, p. 313].

Arijewitsch (A.). **Zur Frage der Pilzerkrankungen der Augenlider und Wimpern.** [Contribution to the question of fungous diseases of the eyelids and eyelashes.]—*Dermatol. Wochenschr.*, xc, 20, pp. 683–685, 1 fig., 1930.

Full clinical details are given of case of acute blepharitis of the right eye in a ten-year-old boy examined at the dermatological department of a Moscow hospital. The condition was found to be due to *Microsporon lanosum* [*R.A.M.*, ix, p. 313], infection by which was presumably due to contact with a horse suffering from squamous lesions of the neck. The patient's mother and her five other children were infected by the same fungus.

Sartory (A.), Hufschmitt (G.), & Meyer (J.). **Contribution à l'étude des onychomycoses. Un nouveau champignon du genre Scopulariopsis Bainier (Scopulariopsis minimus).** [Contribution to the study of onychomycoses. A new fungus of the genus *Scopulariopsis* Bainier (*Scopulariopsis minimus*).]—*Bull. Acad. Méd.*, Sér. 3, ciii, 22, pp. 604–606, 1930.

Scopulariopsis minimus n. sp., isolated from lesions on the nails of a boy, is characterized by a hyaline mycelium, septate hyphae measuring 4 to 10 by 1 to 2 μ, and conidiophores (phialids) 3·75 to 4·50 by 1·25 to 1·50 μ, bearing roundish conidia, pointed at both ends, measuring 1·25 to 1·50 μ in diameter. The reproductive bodies were formed only at a temperature of 37° C., while the optimum temperature for vegetative growth was 28° to 32°.

Pereira. **Cultures de 'piedra' brésilienne : Piedraia sarmentoi n. sp.** [Cultures of Brazilian 'piedra': *Piedraia sarmentoi* n. sp.]—*Comptes rendus Soc. de Biol.*, civ, 21, pp. 680–682, 1930.

Some observations are made on the cultural characters of the fungus responsible in Brazil for 'piedra', a disease of the hair principally affecting young men in the province of Rio Grande do Sul, and restricted, according to Langeron, to regions with an annual rainfall of 1 to 2 m. The organism has been found to differ from *Piedraia hortai* [*R.A.M.*, ix, p. 36] in its rapid growth on Sabouraud's medium and slow development on potato, and in its white, creamy, flat, smooth, ultimately fuliginous, and readily detachable colonies (those of *P. hortai* being greenish with a pale reddish tinge, eventually cinder-black, and very adherent, making poor growth on Sabouraud's medium and developing luxuriantly on potato). The new fungus is named *P. sarmentoi*.

Kletschetoff (A. N.). Несколько слов о новых грибах на Льне. [A few words on new fungi on Flax.]—*Journ. K. A. Timiriaseff Acad. Socialistic Agric.*, Moscow, *1930*, 5, pp. 66–69, 1930.

This is a somewhat abridged version of the author's account of four new species of fungi, namely, *Helminthosporium linicola* and three species of *Fusarium*, isolated by him from flax in Russia, which has already been noticed from another source [*R.A.M.*, viii, p. 786].

Kletschetoff (A. N.). Посевное семя и почва как источники заражения Льна. [Seeds and soil as sources of Flax infection.]—*Journ. K. A. Timiriaseff Acad. Socialistic Agric.*, Moscow, *1930*, 5, pp. 69–81, 1930.

In continuation of his study of 'flax-sickness' of the soil [*R.A.M.*, vi, p. 420], the author states that the examination of a large number of flax seed samples from different flax-growing centres in Russia showed that practically all were more or less heavily infected with *Colletotrichum lini*, *Polyspora lini*, and *Fusarium lini*. The first two named species were usually present on the surface of the seed and could be separated by centrifuging the seed in water, while *F. lini* (except in two cases) was within the seed and could only be detected by the cultural

method. Experiments showed, however, that the use of disinfected or clean seed is not an absolute guarantee against infection of the resulting crop, and mycological investigation of 'flax-sick' soil showed the presence in it of the mycelium and large numbers of spores of the above-named fungi and of *Thielavia basicola*. In the light of these findings, control measures, besides the use of resistant varieties of flax and of clean or disinfected seed, should consist in the removal and burning of all flax débris immediately after the harvest, and deep ploughing in the autumn.

Stem disease caused by *P. lini* was found to have a comparatively small influence on the yield of fibre, but the quality was considerably reduced.

PEELEN (J. R. C.). **Aanleg van Kapokplantingen in verband met optreden van bruine wortelschimmel.** [Establishment of Kapok plantations in connexion with the occurrence of the brown root fungus.]—*De Bergcultures*, iv, 22, pp. 572–579, 5 figs., 2 diags., 1 graph, 1930.

In 1928 some vigorous kapok [*Eriodendron anfractuosum*] trees planted during 1925–6 on a site formerly occupied by *Ficus* [*elastica*] suddenly developed the symptoms characteristic of die-back, i.e., yellow discoloration of the foliage, followed by total defoliation, and brown discoloration of the bark. The tap-root and the main lateral roots were found to be completely rotted, and a number of adventitious roots had been formed at the collar. The causal organism was identified as *Fomes lamaoensis*. The incidence of infection was up to 16 per cent. according to the composition, degree of moisture, and hydrogen-ion concentration of the soil. The fungus has been shown by Steinmann to thrive in soils with a low exchange acidity and a hydrogen-ion concentration of P_H 6 to 7; that of a sample of the diseased soil was found to be P_H 7·74. Infection is more widespread in loose than in stiff clay soils. No direct correlation was found to exist between rainfall and the kapok root rot.

Infection by *F. lamaoensis* is assumed to have spread to the newly planted kapok trees from the old *Ficus* roots and stumps left in the ground after the removal of the trees. The fungus is estimated to have spread at the rate of 1 to 2 m. in two years.

Instructions are given for the control of the brown root rot fungus by direct and indirect measures, including the eradication of diseased trees, the adjustment of the hydrogen-ion concentration of the soil and treatment of the latter with aluminium, alum, or sulphur, and the digging of trenches 1 m. in depth between the *Ficus* stumps and the kapok [cf. *R.A.M.*, ix, p. 687].

WATERMAN (ALMA M.). **Diseases of Rose caused by species of Coniothyrium in the United States.**—*Journ. Agric. Res.*, xl, 9, pp. 805–827, 11 figs., 1 map, 1930.

The recent detection in the United States of brand canker of roses (*Coniothyrium wernsdorffiae*), hitherto reported in Canada and Europe [*R.A.M.*, vi, p. 273; viii, p. 39], led to a comparative study of the morphological and physiological characters of the various species of *Coniothyrium* causing rose diseases in America, and of the distinguishing features of such diseases.

C. wernsdorffiae may be differentiated from the other species of *Coniothyrium* on rose, viz., *C. fuckelii* causing stem canker and *C. rosarum*, responsible for graft canker [ibid., vii, p. 446], by the pronounced 'buffer tissue' of thin-walled cells at the top of the pycnidium, in which the cavity of the papillar ostiole forms, as well as the long ostiolar canal, the spore dimensions (4 to 7·2 by 3 to 5·4 μ), and the greyish colour of the mycelium. Spore germination and growth rate in culture were relatively slow. The spores of the fungus were produced by budding from the layer of cells lining the pycnidial cavity. Inoculation experiments showed that *C. wernsdorffiae* is capable of infecting rose and red raspberry [*Rubus idaeus*] cuttings through dormant buds and wounds; the inoculation of rose leaves and hips gave negative results.

No morphological or physiological differences were discernible between the fungi isolated from the so-called stem and graft cankers attributed to *C. fuckelii* and *C. rosarum*, respectively [ibid., vi, p. 554]. The pycnidia varied from simple uniloculate to complex pluriloculate structures, developing an inconspicuous buffer tissue and papillate ostiole. The mycelium in culture was white or pale grey. The spores, measuring 2 to 4·4 by 1·2 to 3 μ in the stem canker fungus and 2 to 4 by 1·6 to 3 μ in that causing graft canker, were produced by budding, as in *C. wernsdorffiae*. Rose and red raspberry cuttings were successfully inoculated through dormant buds and wounds, with the production of cankers; rose hips were also readily infected, but not the foliage. It would appear from these results that the stem and graft cankers are both due to the same species of *Coniothyrium*, viz., *C. fuckelii*.

FISCHER (R.). **Phytopathologische Mitteilungen. II. Über die durch Bacterium marginatum verursachten Gladiolen-Krankheiten.** [Phytopathological notes. II. On the Gladiolus diseases caused by *Bacterium marginatum*.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxi, 1–7, pp. 80–86, 5 figs., 1930.

This is a more detailed account of the writer's observations on the different manifestations of the gladiolus disease caused by *Bacterium marginatum* than that already noticed from another source [*R.A.M.*, ix, p. 457].

BEWLEY (W. F.) & CORBETT (W.). **Soft rot of the Arum.**—*Fifteenth Ann. Rept. Cheshunt Exper. & Res. Stat., Hertfordshire, 1929*, pp. 52–53, 1930.

Good control of soft rot [*Bacillus aroideae*] of arum lilies [*Zantedeschia aethiopica*: *R.A.M.*, iv, p. 608; viii, p. 196] has been obtained by shaking the plant out of the dry soil and removing all roots from the corm; washing and scraping away the decayed portions of the latter; steeping the plants in a 2 per cent. solution of commercial formaldehyde for two hours; potting in soil sterilized by steam or boiling water; sterilizing the soil and superstructure of the houses with formaldehyde and standing the pots on tiles previously sterilized by heat or formaldehyde, the last precaution being highly important as a means of preventing reinfection.

HAHMANN (C.). **Maiblumenschädigungen beim Treiben 1929/30.** [Lily of the Valley injuries in forcing 1929–30.]—*Blumen- und Pflanzenbau*, xlv, 5, pp. 80–82, 3 figs., 1930.

Lilies of the valley [*Convallaria majalis*] grown under glass in the Hamburg district were affected in 1929 by a pathological condition, presumably of physiological origin but accentuated by secondary fungous and bacterial infection, characterized by arrested growth and decay of the inflorescences. *Botrytis paeoniae* [*R.A.M.*, viii, p. 41] was responsible for the production of brown lesions on the stalks and leaves, leading to the breaking of the plants; under humid conditions the inflorescences are also attacked, the tissues becoming dark brown and sunken. Infection by *B. paeoniae* was observed to pass from lilies of the valley to tulips under glass, and to peonies in the open.

FISCHER (E.). **Eine Krankheit von Cydonia japonica.** [A disease of *Cydonia japonica*.]—*Schweiz. Obst- und Gartenbauzeit., 1930*, 13, pp. 216–217, 1930.

In May, 1930, bushes of *Cydonia japonica* (a species belonging to the *Chaenomeles* section of the genus) at Berne were found to be affected by a disease causing a die-back of entire branches, including the flowers, the ovaries of which were shrivelled and covered with a white coating. The tissues of the ovaries were brown and dead, suggesting that the fungus had penetrated the flower-bud direct from the woody portions. It gave rise to the fructifications of a *Monilia* on the ovary. The causal organism was at first believed to be *Sclerotinia cydoniae*, which produces similar symptoms on quinces [*R.A.M.*, vii, p. 382], but the conidial dimensions differed considerably, those of the *C. japonica* fungus measuring on an average 17 to 18 μ in length by 10·5 μ in diameter (occasionally 11 to 14 by 7 to 10 μ or 25 by 18 μ), compared with 12 by 10 μ in *S. cydoniae*. The apparently new fungus is, therefore, provisionally named *S. chaenomelis*.

JENKINS (ANNA E.). **Sphaceloma symphoricarpi.**—*Mycologia*, xxii, 3, pp. 106–110, 2 pl., 1930.

Explanations are given of the photomicrographs accompanying this paper which depict the appearance of the causal organism of snowberry (*Symphoricarpos albus*) anthracnose (*Sphaceloma symphoricarpi*) [*R.A.M.*, viii, p. 109] in the United States.

NICOLAS (G.) & AGGÉRY (Mlle). **Un troisième exemple d'infection bactérienne généralisée chez les végétaux.** [A third instance of generalized bacterial infection in plants.]—*Comptes rendus Acad. des Sciences*, cxc, 24, pp. 1446–1448, 1930.

A brief account is given of the pathological symptoms observed by the authors from 1928 to 1930 in an arbutus tree (*Arbutus unedo*) in the Botanic Garden of Toulouse, which closely resembled the condition previously described in *Cerasus caroliniana* and *Stranvaesia davidiana* [*R.A.M.*, ix, p. 317]. The disease is again attributed to systemic invasion by a bacterium, some morphological and cultural details of which are given. The organism is believed to be a soil saprophyte which was able to invade the tree owing

to the lowering of its resistance by growth outside its natural station.

STOREY (H. H.). **A mosaic virus of grasses, not virulent to Sugar Cane.**—*Ann. of Appl. Biol.*, xvi, 4, pp. 525–532, 1929.

A brief account is given of a mosaic disease, first observed in the Transvaal in 1924 on a wild species of *Sorghum* (*S. arundinaceum*) and afterwards on cultivated sorghums and maize, the symptoms of which were indistinguishable from those produced by the common sugar-cane mosaic virus. Experiments showed that the disease is transmissible to maize by *Aphis maidis*. As stated in a previous paper [cf. *R.A.M.*, viii, p. 403], preliminary experiments indicated that this virus is not capable of producing visible signs of infection on sugar-cane, a conclusion which was confirmed by subsequent field tests [details of which are given] in the Transvaal, and by the results of large cage experiments in Natal; in the latter series, the method employed was invariably successful in transmitting mosaic to sugar-cane when the source of infection was either diseased cane or diseased grasses collected in the neighbourhood.

KNOCHE (W.). **Zur Verbreitung des 'Palo podrido' in Chile.** [On the distribution of 'palo podrido' in Chile.]—*Zentralbl. für Bakt.*, Ab. 2, lxxxi, 1–7, p. 79, 1930.

According to an oral statement by Prof. W. Gromsch of Magellan, the so-called 'palo podrido' [wood decayed by the action of a fungus of the *Mucor chlamydosporus racemosus* group: *R.A.M.*, ix, p. 282] is widespread in eastern Patagonia (Chile) where, as on the island of Chiloe, it is relished by live stock. The trees involved in the transformation process are *Nothofagus antartica* and *N. betuloides*, the resulting mass being reddish-yellow in the former case and whitish-yellow in the latter.

SIEMASZKO (W.). **Choroby drzew i krzewów owocowych.** [Diseases of fruit trees and bush fruits.]—*Bibljoteka Puławska* No. 6, Puławy, 81 pp., 3 pl., 9 figs., 1929. [Issued 1930.]

This pamphlet (which is a supplement to part 2 of Siemaszko's and L. Kaznowski's collection of exsiccata entitled *Choroby roślin uprawnych* [*Diseases of cultivated plants*]) gives brief accounts of over 70 virus, bacterial, and fungal diseases of fruit trees and bushes, 68 of which are known to occur in Poland. The diseases, which are mostly common ones, are arranged in the systematic order of the causal organisms. Some notes are also given on fruit rots in storage, and considerable space is dedicated to the discussion of control measures, including the preparation and application of fungicides. A special feature of the publication is a detailed calendar schedule for the treatment of the diseases under four headings, namely, diseases of the apple, pear, stone fruits, and currants and gooseberries.

MAYNARD (J. G.) & MARSH (R. W.). **Spraying trials against Apple scab. II. Season 1929.**—*Ann. Rept. Agric. & Hortic. Res. Stat., Long Ashton, Bristol, for 1929*, pp. 155–165, [1930].

A full account is given of further spraying tests against scab

[*Venturia inaequalis*] conducted at Long Ashton [*R.A.M.*, viii, p. 653], in which standard varieties, viz., Grieve, Cox's Orange, Lane's Prince Albert, Worcester Pearmain, Allington Pippin, and Edward VII were given a pre- and post-blossom application (or the former only, at or about the 'green flower' stage) of Bordeaux mixture, lime-sulphur, or colloidal sulphur.

The [tabulated] results showed that the trees sprayed twice gave 99·63 per cent. clean fruit, in a total yield of 20 tons, while even in the plots sprayed only once the amount of clean fruit was never less the 83 per cent. of the total yield; the unsprayed controls (Lane's and Grieve varieties) showed, respectively, 52 and 43·75 per cent. scabbed fruit. Data are given on the Bordeaux injury which resulted on Grieve, Cox's Orange, and Lane's Prince Albert.

The labour costs were considerably less than in 1928 [loc. cit.], owing partly to increased efficiency in handling the machines.

Turner (H. A.) & Dowson (W. J.). **Spraying experiments for black spot and powdery mildew.**—*Tasmanian Journ. of Agric.*, N.S., i, 3, pp. 101–102, 1930.

An account is given of spraying tests conducted in Tasmania on Jonathan, Dunn, and York apples with a carbide mixture [*R.A.M.*, vi, p. 532] against black spot (*Venturia inaequalis*) and powdery mildew [*Podosphaera leucotricha*]. The first application, at the green tip stage, was made on 71 trees, 60 galls. being used, containing 6 lb. copper sulphate and 2¼ lb. calcium carbide. The pink stage application was given at half strength, and 80 galls. were used on 94 trees. The petal fall application was at quarter strength and 80 galls. were used on 86 trees. The rest of the orchard, consisting of Cox's, Dunns, Sturmers, and Jonathans, was sprayed at the last two stages only with lime-sulphur or full or half strength Schloesing's Bordeaux.

Three months later, all the trees given the carbide mixture, especially those sprayed at the green-tip stage, compared very favourably with the rest. Some important advantages of the carbide mixture are the ease of its preparation, its great adhesiveness as compared with lime-sulphur, and the fact that it did not cause leaf scorch, though there was some russeting on the Yorks and more on the Dunns and Jonathans.

Voglino (P.). **L'erpete del Melo.** [Herpes of the Apple.]—*La Difesa delle Piante*, vii, 2, pp. 1–6, 5 figs., 1930.

A full account is given of a slight, localized affection of apple trees in Piedmont, somewhat resembling herpes. Two- (or rarely three-) year-old branches of a few trees developed small protuberances and cracks in the bark, through which showed discoloured cortical tissues bearing black pycnidia. Identical symptoms were observed on young wood where pruning wounds had failed to heal, and also on the stem of one-year-old apple seedlings wilted or dying from various causes and on a quince stock on which a pear had been grafted three years earlier.

Examination of diseased material showed invariably the presence

of a fungus identified as *Diplodina cydoniae*. The conical-spheroidal, almost piriform, fuliginous-black pycnidia, were arranged in groups of 4 to 12, and measured 80 to 180 μ in diameter. The spores, which in very wet weather emerged as a white cirrhus, were long ellipsoidal, with obtuse ends, hyaline, biguttulate and continuous at first, but later divided by a medial septum, and measured 7 to 8 by 3·5 to 4 μ. Before germination they became swollen, constricted at the septum, and up to 12 by 6 μ in diameter. Several germ-tubes were sometimes formed from a single spore, and they gave rise to swollen, short-celled hyphae, which later grew out into filamentous branches, bearing small, elliptical, hyaline conidia, 4 to 5 by 2 μ, at their tips. Pycnidia developed in culture after about five days.

Artificial wound inoculations gave positive results after two months under moist conditions.

Complete control was effected by spraying with Bordeaux mixture (5–3–100).

JENKINS (ANNA E.). **Additional data on the distribution of two species of Sphaceloma.**—*Phytopath.*, xx, 5, pp. 450, 1930.

The causal organism of avocado scab (*Sphaceloma* sp.) is now believed, as a result of inspection of fruits recovered from the baggage of passengers entering the United States from Mexico, to exist in the latter country, as well as in Peru, Cuba, and Florida [*R.A.M.*, vii, p. 176].

Reports of a *Sphaceloma* on apple and pear in Europe have hitherto been received only from Russia and Switzerland, but its recent identification by plant quarantine inspectors on apples brought into the United States by passengers from Italy and Ireland indicates its probable occurrence in those countries also. It is thought likely that this species of *Sphaceloma* may be responsible for the 'spot disease' of apple in Great Britain.

BOTTINI (G.). **Sulle sostanze atte a provocare il riscaldo nelle Pere.** [On substances liable to induce scald in Pears.]—*Ann. Chim. Appl.*, xx, 5, pp. 181–187, 3 col. pl., 1930.

The results of experiments at the Chemico-Agricultural Station, Turin, indicated that the condition known as 'scald' can be experimentally induced in pears [*R.A.M.*, iii, p. 726; ix, p. 660] by the exposure of the fruit to contact with alcoholic ethers, esters, aldehydes, aliphatic and aromatic hydrocarbons, alcohols, and various solvents [cf. ibid., ix, pp. 534, 659]. Such substances cause the death of the epidermal tissues and the development of an enzymatic action, which rapidly destroys the aromatic substances (phenols and glucosides) by oxidation, this process being accompanied by a brown discoloration of the tissues. The admission of air to the fruit through the dead epidermal tissues facilitates the spread of scald in the interior, while moulds complete the work of disintegration. The process of enzymatic oxidation is impeded by acidity in the fruit.

The sole means of reducing the heavy losses caused by scald is by the provision of adequate ventilation in the refrigerating rooms,

and the use of packing material calculated to permit the rapid elimination of the etheric products of metabolism.

HUTCHINS (L. M.). **The phony disease of the Peach.**—*Journ. Econ. Entom.*, xxiii, 3, pp. 555–562, 2 pl., 1930.

Since 1921 the writer has been engaged in an investigation of the phony (a term defined as meaning 'bogus, counterfeit, or false') disease of peaches in Georgia, a preliminary note on which has already been published [*R.A.M.*, viii, p. 388]. Experiments in budding from diseased to normal trees gave negative results nor was infection transmitted by contact between diseased and healthy roots, but when the roots were grafted infection was produced. Up to the present the disease has only been transmitted artificially by root grafting. It occurs on all soil types and transplanting does not effect an improvement. It is not rapidly fatal, though no case of recovery has been seen and fruit production is permanently impaired. Affected trees may live for at least eight years. The incubation period of the disease was found to be about 18 months. The contagious character of the phony disease places it in the peach yellows group [ibid., ix, p. 463] and indicates that the causal organism is a virus which is transmitted under natural conditions in some unknown manner. In the phony disease, however, the infective principle appears to be confined to the roots, while in peach yellows it invades the shoots also.

A very unusual feature of the phony disease, which explains why it is so frequently overlooked, is the deep green colour of the foliage and generally healthy appearance of the trees. The initial symptoms do not develop in commercial plantings before the latter part of the second growing season in the orchard, after which time the trees may be attacked at any age, showing the first signs of infection between 1st May and 15th September. The annual terminal twig growth of a phony tree may be only from one to six inches compared with one to three feet or more in a normal tree. The blossoming, leafing, and fruit-ripening dates may be slightly advanced, and the time of autumn leaf fall retarded, in affected trees. After four or five years of the phony condition the trees generally present a ragged appearance, with a marked dying-back of the terminal twigs and branches.

At the present time the phony disease is found in practically all the commercial peach-growing sections of Georgia, whence it has extended into parts of Alabama and Mississippi. Apparently the disease does not occur in any other part of the United States or elsewhere.

Three distinct lines of control have been adopted, namely, the development of resistant stocks; the elimination of diseased material (500,000 commercial trees were inspected weekly during September, 1929); and quarantine [ibid., ix, p. 416].

The losses to growers from the phony disease consist in a gradual reduction in the size and number of the fruits on affected trees, until after three or four years there may be no marketable peaches. In the district where the disease was first observed, 99 per cent. of the trees in some of the orchards were phony at 12 years old, while in one case 60 per cent. were diseased at 4 years.

Chenev (Gwendolyn M.). **'Black-heart' of Apricots in Victoria.**—*Australian Journ. Exper. Biol. & Med. Sci.*, vii, 1–2, pp. 91–100, 4 pl., 5 figs., 1930.

From apricot trees affected by black heart [*R.A.M.*, iii, p. 47] at Caulfield, Victoria, the writer isolated a microsclerotial species of *Verticillium* agreeing with *V. albo-atrum* (*V. dahliae* of some authors) [ibid., ix, p. 6]. In artificial culture on malt agar the conidia measured 4·5 to 6 by 3·5 to 4 μ. The mycelium was found in the younger wood vessels, the hyphae passing from one vessel to another through the pits. Typical of the disease is the production of a brown, gummy substance in the older wood vessels, causing a brown discoloration which is one of the macroscopic symptoms of black heart.

Negative results followed the inoculation of young apricot trees by the introduction of the mycelium into the branches, but the symptoms of the disease developed after six to eight weeks in trees inoculated through the roots with a spore suspension of the fungus, which was subsequently reisolated from the infected branches.

Protracted culture of the fungus on ground maize agar produced a saltant differing from the original form in the absence of microsclerotia.

Kreutz. **Die Blattfallkrankheit und ihre Bekämpfung.** [The leaf fall disease and its control.]—*Ratschläge für Haus, Garten, Feld*, v, 3, pp. 27–29, 1 fig., 1930.

Popular notes are given on the symptoms and control, under German conditions, of the leaf fall disease of gooseberries and currants (including the ornamental *Ribes aureum*) caused by *Pseudopeziza ribis* [*R.A.M.*, viii, p. 390], which destroys the bushes in three to four years unless combated by the removal of infected material and spraying with solbar (3 per cent. for the first application and 1 per cent. subsequently).

Marsh (R. W.) & Maynard (J. G.). **Black Currant leaf spot disease and its control.**—*Journ. Min. Agric.*, xxxvii, 3, pp. 255–259, 2 pl., 1930.

This paper gives a full account of the results obtained at the Agricultural and Horticultural Research Station, Long Ashton, Bristol, from experiments in the control of black currant leaf spot (*Pseudopeziza ribis*), which have already been noticed from other sources [*R.A.M.*, viii, p. 656].

Beckwith (C. S.) & Hulton (S. B.). **Cranberry false blossom and the blunt-nosed leafhopper.**—*New Jersey Agric. Exper. Stat. Bull.* 491, 16 pp., 6 figs., 1929.

False blossom of cranberries [the symptoms of which are described] has spread so rapidly during the last five years in New Jersey that the complete destruction of all the bogs in the State may be anticipated unless the disease is checked. This can only be effected by the elimination of the carrier, the blunt-nosed leafhopper (*Euscelis striatulus*) [*R.A.M.*, ix, p. 324], which is a single-brooded insect, hatching its eggs in early June, so that the active nymphs or adults are present on the bogs as late as October. A late

reflooding, made as soon as all the leafhoppers have hatched, and held to a head for 12 hours, supplemented by a paraffin spray for the insects floating on the drift, has proved effective. All the eggs of *E. striatulus* may be killed by holding the winter flowage until 5th July. Pyrethrum sprays (400 galls. per acre) have also given good control of the leafhoppers.

WARDLAW (C. W.). **Banana fruit diseases.**—*Trop. Agriculture*, vii, 5, pp. 115–119, 1930.

The author briefly reviews in popular terms some of the more important current literature on fungal diseases of the banana fruit in various parts of the world. The diseases dealt with comprise stem end rot or black end, associated with species of *Verticillium*, *Gloeosporium*, and *Fusarium* [*R.A.M.*, viii, p. 255]; anthracnose [*G. musarum*]; black tip (*Cercospora musarum*) [*Helminthosporium torulosum*: ibid., viii, p. 632. The distinct fungus causing leaf spot disease in Australia, Fiji, Java, and Ceylon (*C. musae* ibid., vii, p. 225), is confused by the author with this species]; freckle or black spot (*Macrophoma musae*) [ibid., vi, p. 364]; cigar end (associated with a *Verticillium*) [ibid., viii, p. 256]; *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., vii, p. 703]; and various secondary conditions associated with *Fusarium* spp. A bibliography of 23 titles is appended.

TOMKINS (R. G.). **The treatment of the cut stalks of fruit to prevent rotting.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1929*, pp. 60–61, 1930.

In a test made to find a simple means of controlling the invasion of cut banana stalks by moulds, in which the cut ends were dipped in numerous [named] fungicides and inoculated with a suspension of the fungi [*Gloeosporium musarum* and *Fusarium* sp.: see next abstract], the only satisfactory control was given by molten paraffin wax, which entirely prevented infection; smearing with vaseline greatly reduced, but did not prevent, infection.

TOMKINS (R. G.) & WOODMAN (R. M.). **Stalk treatment of fruit and vegetables for the prevention of stalk rot, with special reference to Bananas.**—*Journ. Soc. Chem. Ind.*, xlix, 26, pp. 285T–287T, 1930.

Further details are given of the experiments made at Cambridge to control the damage caused to certain fruits by penetration of fungi through the cut end of the stalk [see preceding abstract]. Banana stalks were trimmed free from decayed portions and treated at both ends with the preventive agent. One end was then inoculated with a standard suspension of mycelium and spores of the two fungi commonly associated with rotten stalks, viz., *Gloeosporium musarum* and *Fusarium* sp. [*R.A.M.*, viii, p. 256]. The stalks were stored at 20° and split longitudinally at intervals to determine the extent of rotting.

The results [which are tabulated] of these experiments showed that fungicides were of no value in the control of stem rot. Molten paraffin wax, however, provides an excellent covering impermeable to moulds and completely prevents infection, while vaseline, which

was also fairly effective, enters the tissues and possibly the bundles, thereby securing good contact.

The writers have recently been informed by F. Summers that paraffin wax has proved most effective in Malaya for covering the ends of [rubber] budwood sticks to prevent drying out and the entrance of fungi. This worker emphasizes the importance of using products free from low-boiling kerosene fractions, which exert a considerable toxic action on plant tissues under tropical conditions.

AYYANGAR (C. R.). **Study of a Fusarium isolated from wilted Plantains.**—*Madras Agric. Dept. Year Book 1929*, pp. 16–21, 1 pl., 1930.

Chinna mondan plantains at Arapalaiyam and Sholavandan, in the Madura district of Madras, were attacked in 1927 by a wilt disease [the symptoms of which are described] causing the destruction of nearly 30 per cent. of the plants in the first-named village. The causal organism [the morphological and cultural characters of which are indicated] was identified by Wollenweber as *Fusarium cubense* var. *inodoratum* [*R.A.M.*, ix, p. 88].

Middelen tegen plantenziekten en schadelijke dieren in land- en tuinbouw. [Methods for the control of plant diseases and insect pests in agriculture and horticulture.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 43, 24 pp., 1930.

This is an amplified account, containing a number of new entries, of the standard up-to-date methods of controlling fungous diseases and insect pests of agricultural and horticultural crops in Holland and elsewhere [*R.A.M.*, v, p. 170].

WHETZEL (H. H.) & MCCALLAN (S. E. A.). **Studies on fungicides. I. Concepts and terminology. II. Testing protective fungicides in the laboratory. III. The solvent action of spore excretions and other agencies on protective copper fungicides.**—*Cornell Agric. Exper. Stat. Memoir* 128, 79 pp., 2 figs., 4 graphs, 1930.

This memoir is stated to be the first of a series of publications under the general title 'Studies on fungicides', which will report the results obtained at Cornell University in the investigation of fundamental problems involved in the efficacy of fungicides. In the introductory paper the senior author briefly discusses some basic concepts, and points out the looseness in the light of present knowledge of some terms now in general use.

In the second paper, McCallan describes the technique evolved for the testing of the preparations, with special reference to protective sprays and dusts, and gives details concerning the methods of application of the fungicides and the recording of the data obtained.

In the third paper, also by McCallan, the existing literature relative to the liberation of copper from nominally insoluble copper compounds in protective fungicides is reviewed, and details are

given of experiments to test the main hypotheses advanced by other investigators to explain this phenomenon. Since preliminary experiments showed that the conidia of *Sclerotinia americana* were one hundred times more sensitive to copper than the potassium-ferrocyanide test, most of the tests for the presence of toxic quantities of copper were made by the germination of these conidia on slides that had been dusted or sprayed and allowed to dry with the fungicide under examination.

The toxicity of copper sulphate solutions to the spores of *S. americana* was shown to be directly correlated with the total content of copper (calculated on the basis of concentration and volume of the solution), and inversely related to the number of spores. It was noted, however, that with age the spores of the fungus become more sensitive to a given concentration of the solution, and that while a small volume of very dilute copper sulphate may be non-toxic, a larger volume at the same concentration may kill the spores. This toxicity of dilute solutions is, however, dependent on the rate of diffusion of the copper ions. Five- to ten-day-old spores at a concentration of about 1000 per 0·05 c.c. of solution, were markedly sensitive to 0·2 mgm. of copper per litre of copper sulphate solution. Chemically pure calcium carbonate did not exert any toxic effect on the spores, but chemically pure calcium hydroxide and calcium sulphate solutions were shown to be somewhat toxic. Filtrates of chemically pure copper carbonate and copper hydroxide in distilled water contained sufficient quantities of soluble copper to kill the spores.

The experiments also indicated that, in the absence of the fungus, atmospheric agencies are relatively unimportant in the liberation of copper from the deposit on glass slides of Bordeaux mixtures or copper-lime dusts; rain water appeared to possess greater solvent action than distilled water, since filtrates prepared from it were more toxic, but rain water by itself was less favourable for the germination of the spores than distilled water. In the presence of the spores, however, copper was invariably liberated, as shown by the toxicity of the filtrates from such suspensions: filtrates from suspensions of germinating spores alone were non-toxic. In the same way, Bordeaux mixture included in collodion sacs of a certain degree of porosity did not diffuse soluble copper in the absence of the spores, but when these were present in the water surrounding the collodion sacs containing Bordeaux mixture, they did not germinate because of the diffusion of toxic quantities of soluble copper. These experiments are considered to demonstrate the excretion of a solvent agent by the germinating spores. Another set of tests, in which spores were placed at varying distances from a drop of dried Bordeaux mixture on a slide and connected therewith by a bridge or film of water, showed that direct contact with the fungicide is not essential for toxic effect, since the germination of the spores was entirely inhibited at a distance of 7·5 mm., and gradually increased with the distance from the drop of fungicide.

Preliminary tests appear to indicate that the excretions of germinating spores of *S. americana* are very slightly acid, to the extent of about the equivalent of N/20,000 HCl.

Butler (O.) & Jenkins (R. R.). **Effect on plants of cyanide fumigation following spraying with Bordeaux mixture.**—*Phytopath.*, xx, 5, pp. 419–429, 6 figs., 1930.

The results [which are described and tabulated] of chemical analyses showed that the formation of cupric cyanide in a Bordeaux mixture exposed to cyanide fumigation is determined by the ratio of copper sulphate to quicklime used in making the mixture. Cupric cyanide does not form, and the mixture is not harmful, when the ratio employed is 1 : 0·2 (neutral Bordeaux). The 1 : 1 mixture is in general the most toxic to the plants, except when they are kept moist a day or so after spraying when the 1 : 4 and 1 : 6 mixtures show extreme toxicity. In mixtures of ratios exceeding 1 : 1 but less than 1 : 6 the quantity of cupric cyanide formed decreases with the increase in calcium hydrate, but the formation of a soluble double cyanide becomes more abundant. The latter is injurious if the sprayed and cyanided plants are wetted. A neutral or approximately neutral Bordeaux mixture is the only type to be recommended when the sprayed plants are to be subjected to cyanide fumigation. Even this should not be used on plants more sensitive to soluble copper than the tomato.

Barker (B. T. P.). **Investigations on the fungicidal action of sulphur. IV. Third progress report.**—*Ann. Rept. Agric. & Hortic. Res. Stat., Long Ashton, Bristol, for 1929*, pp. 130–148, [1930].

A full account is given of the author's continued investigations at Long Ashton, Bristol, into the fungicidal action of sulphur [*R.A.M.*, vii, p. 655], with special reference to the identification of the reducing substance or substances formed by the living organism and to the exact nature of the action which culminates in the reduction of sulphur to a sulphide, the means by which the living organism effects this reduction being termed the 'reducing factor'.

Tests of the sulphur-reducing factor of numerous [named] flowering plants and fungi demonstrated that in the higher plants only the stomatal surfaces of the leaves showed reducing power.

Experiments with *Saccharomyces anomalus* (*Willia anomala*), in the course of which it was found that the addition of flowers of sulphur to sugar solutions in active fermentation by pure cultures of this yeast was followed by a copious evolution of sulphuretted hydrogen, indicated that this yeast offered a much more satisfactory opportunity of investigating the sulphur-reducing factor of plants than did the previously used strawberry leaves. Pressed yeast was found to answer the purpose most satisfactorily.

The evidence obtained in the experiments with yeast [which are described] on the whole favoured the view that the reducing mechanism can function apart from the organism, whether living or dead, and that, accordingly, the reducing factor must be a chemical substance or mixture of substances, and the reaction purely chemical.

The observations made on the nature of the reducing action indicated that the reaction was more complex than a simple and direct reduction of sulphur to hydrogen sulphide. Thus, in tests with the internal tissues of fruits and vegetables when, after the

tissue had been ground up in the presence of sulphur a few drops of sulphuric acid were added before heating (or after, subsequently reboiling), a much deeper stain on the lead acetate paper was obtained than when the pulped tissue was heated without acidification. Further, strawberry leaf extract also required acidification with sulphuric acid after heating before further heating gave a sharply marked stain on the test paper. In both cases, if the plant material was acidified with sulphuric acid before the addition of sulphur no sulphide stain could be obtained on the test paper.

It is, therefore, presumed that the sulphuring of the plant material leads to the formation of a sulphur compound more or less resistant to temperatures up to 100° C., which is decomposed on the addition of a mineral acid, with hydrogen sulphide as a product of decomposition. This was confirmed by a test in which, when yeast was treated with a cold 1 per cent. solution of caustic potash, the mixture neutralized with sulphuric acid, and sulphur then added, hydrogen sulphide was evolved on heating after a further addition of sulphuric acid. The reducing factor thus retains its activity after treatment with an alkali, and loses it if treated with dilute sulphuric acid. In view of this, observations made by other workers are considered to be readily explainable without resort to the hydrolysis hypothesis of the fungicidal action of sulphur [ibid., ix, p. 468].

The author concludes that the reaction causing sulphur reduction takes place outside the organism and is effected by means of a substance or substances emerging from the plant. Hydrogen sulphide appears as an end product, but varied experiments indicated that under certain conditions an intermediate, more complex, sulphur compound is formed. The hydrogen sulphide would account for the fungicidal value of sulphur [ibid., viii, p. 798].

In a foot-note it is stated that further results obtained point to glutathione (probably identical with the hypothetical 'philothion' of de Rey-Pailhade) as the reducing factor.

Wilcoxon (F.) & McCallan (S. E. A.). **The fungicidal action of sulphur: I. The alleged rôle of pentathionic acid.**—*Phytopath.*, xx, 5, pp. 391–417, 2 figs., 8 graphs, 1930.

After a brief review of the various theories which have been advanced to explain the fungicidal action of sulphur, with special reference to Young's pentathionic acid hypothesis [*R.A.M.*, viii, pp. 390, 391], the writers describe the technique and results of a series of tests to determine the toxicity of sulphur in various forms to the spores of *Botrytis* sp. (*cinerea* type) from marigold [*Calendula officinalis*], *Macrosporium sarcinaeforme*, *Sclerotinia americana*, and *Uromyces caryophyllinus*. The spores were suspended in the liquid sulphur preparations in moist chambers or, in tests with the dry preparations, the slides were first dusted and an aqueous suspension of the spores was then added. The slides were kept moist at a temperature of 19° to 23° C., and the spores examined for germination after 18 to 48 hours.

The comparative toxicity of pentathionic acid, sulphuric acid, and hydrogen sulphide to the above-mentioned four fungi was determined. The toxicity of the two first-named acids was appa-

rently due to the hydrogen-ion, a comparatively high concentration of which was essential for its manifestation. Hydrogen sulphide was found to be from 6 to 200 times as toxic as the two acids [see preceding abstract].

When percentage of germination is plotted against concentration of a toxic agent, a sigmoid curve is obtained [cf. ibid., i, p. 114]. This curve appears to be the integrated form of a normal distribution curve, which may possibly indicate the distribution of resistance among the individual spores used.

The neutral salts of pentathionic acid were only toxic to *S. americana* when treated with sodium hydroxide, which destroys the pentathionate and forms colloidal sulphur.

Most samples of sulphur were found to give water extracts responding to qualitative tests for pentathionic acid, but these extracts did not prove toxic under the conditions of the tests.

The toxicity of the sulphur dusts was shown to be increased with the fineness of subdivision of the particles [ibid., ix, p. 664]. A commercial 300-mesh dusting sulphur, treated with sodium hydroxide to remove the pentathionic and sulphuric acids, was equally toxic with the same preparation before treatment. It is concluded, therefore, that pentathionic acid does not play an important part in the fungicidal action of sulphur [see next abstract].

Liming (O. N.) & Young (H. C.). **Toxicity of sulphur to spores of Sclerotinia cinerea as affected by the presence of pentathionic and other sulphur acids.**—*Journ. Agric. Res.*, xl, 10, pp. 951–962, 6 diags., 5 graphs, 1930.

Of a number of sulphur acids tested [by methods which are fully described] for their toxicity to *Sclerotinia cinerea*, pentathionic acid was the only one showing a marked fungicidal action [see preceding abstract]. The toxicity of the sulphuric, sulphurous, dithionic, and trithionic acids was negligible. Filtrates from wetted sulphur (ordinary ground sulphur and flowers of sulphur) contained pentathionic acid and exerted a fungicidal action. Sulphur freed of pentathionic acid, either by strong alkali or acid or by washing, was not toxic. Acid-free sulphur aerated for eight hours regained its normal toxicity, indicating that this property is consequent on the oxidation of sulphur. Qualitative tests for pentathionic acid under such conditions gave positive results. Sulphur-lime mixtures exposed to air, light, and heat (80° C.) in the presence of moisture tended to become less alkaline, whereas in closed flasks in the laboratory the reaction underwent no change: it is thus apparent that water is essential to the formation of acids on sulphur and that high temperatures favour the development of an acid reaction.

Field tests confirmed the laboratory results in respect of the superior efficacy against apple scab (*Venturia inaequalis*) of sulphur with the admixture of an oxidizing agent (permanganate dust at 1 and 2·5 per cent. or manganar, in which manganese dioxide is the oxidizing agent, at 4 per cent. for the pre-blossom application and 10 per cent. thereafter). The permanganate plots showed rather severe injury from leaf drop and scald, a feature

which was practically absent in those treated with the manganese arsenate-sulphur mixture.

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur : das Jahr 1929.** [Bibliography of plant protection literature for the year 1929.]—*Biol. Reichsanst. für Land- und Forstwirtsch., Berlin-Dahlem*, 246 pp., 1930.

This bibliography of German and foreign literature published during 1929 on various aspects of phytopathology and plant protection has been compiled on the usual lines [*R.A.M.*, viii, p. 661].

BUTLER (E. J.). **Some aspects of the morbid anatomy of plants.** —*Ann. of Appl. Biol.*, xvii, 2, pp. 175–212, 5 pl., 13 figs., 1930.

In this paper the author gives some details of the anatomical modifications caused by gall-inducing fungi and insects in the tissues of a number of different plants, and compares them with those produced by various processes of regeneration and wound healing or by factors, such as nutrition, humidity, and the like, which directly influence the anatomical structure of plants without the intervention of wounds. The conclusion drawn from this study is that all living cells have the inherent power of reacting to various stimuli by hypertrophy, hyperplasy, or the development of meristematic tissue, and that the pre-existing meristems are not, of necessity, primarily implicated in the formation of galls.

BEWLEY (W. F.) & CORBETT (W.). **The control of Cucumber and Tomato mosaic diseases in glasshouses by the use of clean seed.**—*Ann. of Appl. Biol.*, xvii, 2, pp. 260–266, 1930.

The authors claim to have obtained evidence through observations made since 1919 in a large number of nurseries in England and through their own experiments at the Experimental and Research Station, Cheshunt, of the transmissibility by seed of the cucumber and tomato mosaics. Thus, 17 out of 100 cucumber plants from seed suspected to carry infection contracted mosaic, while in a batch of 493 tomatoes raised from seed taken from infected fruits, 6·04 per cent. of the seedlings developed mosaic. Of six tomato plants inoculated with an inoculum prepared from crushed embryos separated from a lot of immature seed of a plant severely infected with aucuba mosaic, four showed definite symptoms of the disease, and in another series of tests, in which the embryos were washed in running water for 24 hours before being crushed and inoculated into 24 plants, five of the latter developed mosaic, every care having been taken to prevent external infection. Details are also given of the results obtained at the Cheshunt Station in the work of cleaning existing stocks of cucumber and tomato seeds from the disease, which give every reason to believe that the incidence of mosaic in both crops in glasshouses can be reduced to insignificant proportions, if not entirely eliminated, by the use of clean seed.

Krause (A. W.). **Untersuchungen über den Einfluss der Ernährung, Belichtung und Temperatur auf die Perithecienproduktion einiger Hypocreaceen. Beitrag zur Kulturmethodik einiger parasitärer und saprophytischer Pilze.** [Investigations on the influence of nutrition, illumination, and temperature on the perithecial production of some Hypocreaceae. Contribution to the cultural technique of some parasitic and saprophytic fungi.]—*Zeitschr. für Parasitenkunde*, Ab. F, ii, 4, pp. 419–476, 2 figs., 2 graphs, 1930.

This is a comprehensive account of the writer's studies, conducted at the Biologische Reichsanstalt, Berlin-Dahlem, on the influence of various environmental conditions on perithecial production in seven Hypocreaceae, viz., *Gibberella saubinetii* from sweet potato (United States), *Neocosmospora vasinfecta* from *Cicer arietinum* (India), *Melanospora* sp. from *Sorbus* [*Pyrus*] *aucuparia* (Erzgebirge, Germany), *Hypomyces ipomoeae* from sweet potato (United States), *H. cancri* from tea (Assam), *Nectria punicea* from *Rhamnus frangula* (Germany), and *N. coccinea* from *Ulmus fulva* (Germany) [*R.A.M.*, vii, p. 676].

The development of the perithecia was found to depend to a great extent on the nitrogen and carbon contents of the media, the former being more important than the latter. The prospect of finding any medium calculated to induce perithecial development suitable for all the organisms is considered to be remote. Temperature exerted a marked effect on perithecium formation in *Neocosmospora* and *Nectria coccinea*, both developing in a minimum period (17 days) at 31·5° and 30° C. At 28·5°, the former still developed perithecia in 17 days while the latter required 30. The maximum period for perithecium development was 43 days for *Neocosmospora vasinfecta* and 45 for *Nectria coccinea* (at 22·5° and 7°, respectively). *Melanospora* sp. and *H. cancri* were unable to develop in the absence of light, while the other fungi investigated varied in their light requirements. *G. saubinetii*, *Neocosmospora vasinfecta*, *H. ipomoeae*, and *Nectria coccinea* were unable to tolerate excessively bright illumination. The hydrogen-ion concentration of the medium, within the usual limits, failed to influence perithecial formation.

It is concluded that the reactions of the Ascomycetes to external factors are so divergent that no general procedure for favouring perithecial formation in all members of this group can be formulated. Probably this divergency also accounts for the variability of perithecial production under natural conditions.

Young (Elaine H.). **Physiological studies in relation to the taxonomy of Monascus spp.**—*Trans. Wisconsin Acad. Sci., Arts, and Lett.*, xxv, pp. 227–244, 2 pl., 1930.

A strain of *Monascus ruber* van Tieghem causing mould on maize starch in a starch factory in South Africa, two strains from maize silage in Australia, and another from a similar environment in Nebraska were investigated. Under certain conditions it was found that *M. ruber* can destroy entire starch blocks. The fungus grew luxuriantly between 30° and 35° C., and made some growth at 40° but none at 45°. Growth was considerable in 1 per cent. lactic

acid, and perithecia were produced in sulphur dioxide solutions of concentrations up to 0·1 per cent. This tolerance of acid media and high temperatures is regarded as sufficient to explain the occurrence of the fungus in the situations mentioned, especially as the affected starch contained a considerable amount of proteins and experiments showed that growth is favoured by these.

Notes are given on the differences between this fungus and other species of the genus.

NICOLAS (G.). **Sur la transpiration des plantes parasitées par des champignons.** [On the transpiration of plants parasitized by fungi.]—*Rev. Gén. de Botanique*, xlii, 497, pp. 257–271, 1930.

After briefly surveying previous investigations into transpiration and assimilation in plants attacked by various fungi the author describes experiments carried out by him in Algiers in 1919 and at Nancy in 1920. Tests were made which showed that the stems of *Mercurialis ambigua* [*M. annua*] attacked by *Melampsora pulcherrima* and exposed to the sun for 30 and 40 minutes transpired, respectively, 1·19 and 4·59 times as much water as did healthy stems. Similar results were obtained (amongst other plants) with leaves of *Lavatera cretica* infected with *Puccinia malvaceurum* (1·11 times), *Anemone nemorosa* infected with *P. fusca* (1·01 by weight and 1·85 by surface), peach with *Taphrina deformans* (1·37 and 3·01), ivy with sooty mould [*Fumago* sp.] (2·21 and 2·50), inflorescences of *Capsella bursa-pastoris* with *Cystopus candidus* (1·17), petioles of *Ranunculus macrophyllus* with *Urocystis anemones* (1·95), and panicles of *Arrhenatherum elatius* [*A. avenaceum*] with *Ustilago perennans* (1·26). On the other hand, leaves of *Anemone coronaria* attacked by *Puccinia pruni* [*-spinosae*] transpired only 0·95 times as much water for a similar weight of leaf, though 2·84 times as much when calculated by surface, owing, apparently, to a great increase in the weight of the leaf brought about by the parasite. The increased transpiration in the case of the sooty mould, a pure saprophyte, is due partly to a rise in temperature of the leaf, resulting from the black coating of the fungus, and partly to loss of water sustained by the fungus itself. In the other cases, water is taken up from the leaf into the mycelium, and thus, especially in ectophytes like species of *Oidium*, the evaporating surface is enlarged. The host cells are also injured, with resultant loss in their power to retain water, and the epidermis is often ruptured, with a still further increase in the loss of water.

SMITH (K. M.). **Studies on Potato virus diseases. VII. Some experiments with the virus of a Potato crinkle with notes on interveinal mosaic.**—*Ann. of Appl. Biol.*, xvii, 2, pp. 223–240, 4 pl., 1 diagram, 1930.

In continuation of his study of virus diseases of the potato [*R.A.M.*, ix, p. 123], the author describes experiments in the transmission by different methods of crinkle [ibid., ix, p 603] on Myatt's Ashleaf variety and of interveinal mosaic on the President variety. Needle inoculations of the crinkle virus produced a mosaic mottling in President, a crinkle in Arran Victory, and

a crinkle accompanied by streak lesions on the leaves in Great Scot. The aphid *Myzus persicae* was able to transmit the virus to President only, which developed a crinkle of a mild type. Healthy President and Arran Victory plants grafted with crinkle scions developed crinkle comparable to the original one, while similarly treated Great Scot plants developed a severe streak involving the growing points, with little or no crinkling, and Kerr's Pink showed streak lesions and mottling. Needle inoculations of potato crinkle on White Burley and Virginia tobacco gave rise to a severe necrotic disease, the virulence of which was increased by successive passage through these hosts; when returned to healthy potato plants of nine varieties, the virus produced severe crinkle and leaf-drop streak, especially in Big Ben which was invariably killed by the disease. When tobacco was inoculated with potato crinkle by means of *M. persicae*, the symptoms differed from those obtained by needle inoculations, and consisted of spots and faint green lines; returned to potato, the virus produced crinkle and leaf-drop streak. Passage of the original crinkle virus through *Datura stramonium* appeared to lower its virulence, since when returned to President potato it only produced a mosaic mottling.

Interveinal mosaic of President was shown to be transmissible by needle or by *M. persicae* only to healthy plants of the same variety, but when scions of diseased President were grafted on healthy Arran Victory and Great Scot, the first showed interveinal mosaic with numerous streak lesions, and the second developed a form of leaf-drop streak. On tobacco the virus, transmitted by needle, produced a well-marked ringspot, and when returned to potato by needle, gave rise to interveinal mosaic with the addition of streak lesions, marked curling, and distortion of the leaves. Successive passage of the virus through tobacco increased its virulence to potato, in which it produced a severe form of streak which obscured the symptoms of interveinal mosaic.

WHITEHEAD (T.). **Transmission of Potato leaf-roll.**—*Nature*, cxxv, 3165, pp. 974–975, 1930.

The results of experiments on potato leaf roll at the University College of North Wales, Bangor, have shown that *Myzus circumflexus* is almost as reliable a transmitter of the disease as *M. persicae* [*R.A.M.*, ix, p. 477]. With the former insect, however, the symptoms develop much more slowly. *M. circumflexus* does not appear to occur on field potatoes in Great Britain, but it has been found on *Hordeum*, *Avena*, and *Trifolium pratense*, a fact which should be borne in mind by workers attempting to maintain healthy potato stocks by isolating them in cereal crops or by intervening meadow land. Under glass, however, the insect feeds voraciously on the sprouts, stems, and leaves of potatoes, and has proved more prolific than either *M. persicae* or *Macrosiphum gei* (which can apparently also transmit leaf roll to a slight extent).

LEMMERZAHL (J.). **Beiträge zur Bekämpfung des Kartoffelkrebses.** [Contributions to the control of Potato wart.]—*Phytopath. Zeitschr.*, ii, 3, pp. 257–320, 17 figs., 1 diag., 1930.

A detailed account, accompanied by tables, is given of the

author's experiments at Berlin-Dahlem in the control of potato wart (*Synchytrium endobioticum*) by soil disinfection [*R.A.M.*, ix, p. 334]. Preliminary varietal susceptibility tests were carried out by Spieckermann's method [ibid., iii, p. 600] with modifications introduced by the writer. The best results in greenhouse tests were given by crude benzol at the rate of 500 c.c. per 3,500 c.c. of soil, while 3 per cent. formalin at the same rate was scarcely less effective. Cresol sulphuric acid (3 per cent.) at the rate of 500 c.c. per 3,500 c.c. of soil, and chloride of lime (12 gm. per 3,500 c.c.), were less efficacious than the foregoing, but nevertheless showed a considerable degree of disinfective capacity. None of these preparations gave complete control in the field: crude benzol (28 l. per sq. m.) was again the most satisfactory, followed by 1 per cent. formalin (35 l. per sq. m.).

Braun (H.). **Der Wurzeltöter der Kartoffel Rhizoctonia solani K.** [The root destroyer of the Potato, *Rhizoctonia solani* K.]—*Monogr. zum Pflanzenschutz*, 5, 136 pp., 14 figs., 2 diags., 1 graph, J. Springer, Berlin, 1930.

This is a comprehensive account, based on early and contemporary literature as well as on personal observations, of the *Rhizoctonia* disease of potatoes (*R. solani*). In regard to the nomenclature of the perfect form and its exact systematic position within the Basidiomycetes, the author considers that it is not yet quite certain whether the fungus should be regarded as a *Hypochnus* or a *Corticium*, or whether the specific name should be *vagum* or *solani*. The aspects of the problem discussed include the economic importance of the fungus; a brief historical survey; taxonomy, synonymy, and systematic position of the causal organism; geographical distribution, incidence, and hosts (a list numbering some 230 of which in 66 families is given); pathological symptoms; morphology and physiology (life-history, cytological and sexual relations, external and internal factors influencing development, persistence and dissemination); relations between parasite and host (penetration, growth within the plant, pathological histology, resistance, immunity, and virulence, and influence on the disease of such external factors as soil type and reaction and atmospheric conditions); and control by cultural and technical measures, the latter including soil disinfection and seed treatment with appropriate fungicides.

A twelve-page bibliography (for which the author makes no claim to completeness) is appended.

Sanderson (A. R.). **Annual Report 1929. Pathological Division.** —*Ann. Rept. Rubber Res. Inst. Malaya, 1929*, pp. 58–65, 1930.

Cases of secondary leaf fall of *Hevea* rubber due to *Oidium heveae* were reported during the year from districts of Malaya hitherto exempt from infection, among those involved being Perak, Selangor, Negri Sembilan, and Malacca [*R.A.M.*, ix, p. 127]. Mouldy rot of the tapped cortex (*Sphaeronema fimbriatum*) [*Ceratostomella fimbriata*; ibid., ix, p. 485] was reported from all parts of the Peninsula during the same period. The disease can

no longer be considered to be restricted to wet seasons, cases having been reported during relatively dry periods.

Fomes lignosus [ibid., ix, p. 127] appears to be the chief cause of root disease in rubber under five years old, while *F. pseudoferreus* [ibid., viii, p. 267] constitutes the most serious menace to mature areas in Malaya. Recent investigations have shown that the spread of the latter fungus takes place almost exclusively by root contact. Two cases of infection of trees under seven years old (an unusually early age) were observed.

Notes are given on various other diseases and pests of rubber.

De Vos (W. A.). **De behandeling van bruine-binnenbast.** [The treatment of brown bast.]—*De Bergcultures*, iv, 22, pp. 565–566, 1930.

At the first unmistakable symptom of brown bast of *Hevea* rubber [*R.A.M.*, ix, pp. 57, 126, 484], viz., the after flow of latex, the tapping surface should immediately be curtailed from $\frac{1}{3}$ to $\frac{1}{4}$ or if necessary to $\frac{1}{8}$; in most cases this will lead to a cessation of the after flow. The tapping cuts should then be maintained at the reduced circumference. Trees showing advanced symptoms of brown bast should be given a complete rest for at least six months, after which they may be examined at three-monthly intervals to ascertain whether the resumption of tapping is advisable. On an estate where this method is practised, the tapping surface was restricted in 4·3 per cent. of the trees and tapping was abandoned in 2 per cent. during the past year, the yield being 400 kg. per bouw [0·71 hect.].

Bayliss Elliott (Jessie S.). **The soil fungi of the Dovey salt marshes.**—*Ann. of Appl. Biol.*, xvii, 2, pp. 284–305, 11 figs., 1930.

The mycological investigation during the period from 1926 to 1928 of the soil of the Dovey salt marshes, Wales (a stiff, tenacious, badly aerated clay, with alkaline reaction and a high water content), led to the determination of 48 species of fungi, twelve of which, as far as the author is aware, are first records for the British Isles. Brief notes and figures are given of the more interesting species, including a new species or abnormal form of *Stysanus*. Three species, namely, *Torula allii*, *Penicillium hyphomycetis*, and *Fusarium oxysporum* var. *resupinatum*, were found in almost every sample of soil, and *Trichoderma lignorum*, *T. köningi*, *Hormodendrum cladosporioides*, *Mucor circinelloides*, and *Periconia felina* were almost equally common.

Most of the samples of soil were taken from the Glycerietum and Armerietum zones of the marshes, which had the same species of fungi in common. The great majority of fungi found are above-ground saprophytes, and may have been introduced into the soil by drainage or other similar factors.

Gram (E.). **Forsøg med Plantesygdomme og Jordtraethed.** [Experiments with plant diseases and soil exhaustion.]—*Tidsskr. for Planteavl.*, xxxvi, 2, pp. 291–333, 18 figs., 1 diag., 1930. [English summary.]

Several types of so-called 'soil sickness' occurring in Denmark

were shown, by observations and experiments extending over the period from 1910 to 1924, to be due partly to infectious diseases, partly to defective nutrition, and in some cases to a combination of these factors or to an unfavourable soil reaction. Thus, the familiar yellow patches in barley fields were found to be due to potassium deficiency, aggravated by low temperature. Fields showing yellow patches yielded by extraction with carbonic acid 2 to 4 mg. K_2O from 1 l. of soil, compared with 9 or more mg. from the soil of healthy fields. Excess of potassium produced a marked rolling of leaves and positive starch iodine reaction in healthy potato plants, as well as an increase of rolling due to leaf roll virus disease, *Rhizoctonia* [*Corticium*] *solani*, and other causes [*R.A.M.*, ix, p. 123 *et passim*]. Potato plants with potash-induced starch accumulation and marked symptoms of leaf roll yielded perfectly healthy progeny in the following year, thereby distinguishing them from the ordinary infectious form of the disease. Potassium starvation was found to cause the development of necrotic spots on potato leaves from July onwards, accompanied by premature wilting; the tubers of such plants are very liable to assume a dark discoloration on boiling [cf. ibid., viii, p. 598]. An improvement in this condition was effected on one farm by applications of potassium.

Leaf scorch of red currants was successfully treated by the application of potassium salts, especially potassium sulphate (500 gm. per bush) [ibid., ix, p. 44]. Similar effects were obtained by the use of chicken manure and other natural manures containing a high proportion of potassium, the action of which, however, may not be apparent for two years or so.

Less disease than might be anticipated followed the continuous cultivation of one crop in the same area. However, barley, wheat, and rye grown under these conditions suffered severely from foot rot [*Ophiobolus graminis*, *Leptosphaeria herpotrichoides*, and other fungi: ibid., vii, p. 222; and above, p. 701], while oats showed defective kernel development. The intensity of grey speck of oats [ibid., viii, p. 751 and next abstract] was found to fluctuate not only with the soil reaction but also according to the variety.

Samuel (G.) & Piper (C. S.). **Manganese as an essential element for plant growth.**—*Ann. of Appl. Biol.*, xvi, 4, pp. 493–524, 3 pl., 1 fig., 1 graph, 1929.

In continuation of previous work on the grey speck (manganese deficiency) disease of oats [*R.A.M.*, vii, p. 469, and preceding abstract] at the Waite Agricultural Research Institute, South Australia, the authors investigated the part played by manganese in the normal growth of plants, and the factors that influence the absorption of manganese by them. The results of the tests (in which three varieties of wheat, four varieties of oats, and 13 other species of plants were grown in water cultures, special precautions being taken to ensure the absolute freedom of the latter from manganese) showed that manganese is an essential element for plant growth, which becomes necessary at an early seedling stage, and continues so until late in life. Manganese deficiency is chiefly manifested by an early cessation of development, followed by death

of the undeveloped tissues at the growing points. Although in many cases a special type of chlorosis occurs before the collapse of the tissues, the use of the term chlorosis is considered to be misleading to describe the primary symptom of the disease.

Oats did not reach complete development in water culture with a manganese concentration of one part in fifty million parts of the nutrient solution, but there was evidence that this concentration would be sufficient if a method were devised for the continuous change of the solution. The minimum manganese content of the Algerian oat plant for healthy growth was found to be about 14 parts per million of the dry matter at the flowering stage; on soils on which the oats are unable to absorb this minimum quantity, they develop the grey speck disease, which may be cured by application of a soluble manganese salt. On soils with abundant available manganese, the oats absorb considerably more of the element than required for normal development, without showing any injury. The amount absorbed varies considerably, and is believed to depend to some extent on soil reaction and aeration.

There was no evidence that such factors as traces of organic matter or excess of calcium ions play any part in the appearance of the disease in water cultures containing a soluble manganese salt, but there still is the possibility that they may have some effect on the availability of manganese in the soil, in conjunction with other, as yet undetermined, factors. None of the ten different rarer elements tested, nor the combination of zinc, copper, boron, and aluminium, was able to replace manganese in the growth of oats.

Reincke (R.). **Die Kalkempfindlichkeit der gelben Lupine und der Anteil der Knöllchenbakterien an der Erkrankung.** [The calcifuge habit of the yellow Lupin and the part played by the nodule bacteria in the disease.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xvii, 1–2, pp. 79–102, 1930.

Hitherto chlorosis, a specifically juvenile disease of yellow lupins, and a pathological condition due to deficiency of nitrogen in the soil and characterized by a marked reduction in the activity of the nodule bacteria, have been considered as one manifestation under the heading of the 'calcifuge habit' [*R.A.M.*, i, p. 445]. In this comprehensive study, however, the writer distinguishes between the two symptom-complexes, either of which may occur independently of the other. The blue lupin is highly resistant to chlorosis but may be affected by the nitrogen deficiency disease. The latter is attributed to the accumulation of calcium ions in the soil solution, acting indirectly on the bacteria through modifications in the root system of the plants, rather than to the production of an alkaline reaction by the lime.

Salmon (E. S.) & Ware (W. M.). **The chlorotic disease of the Hop.**—*Ann. of Appl. Biol.*, xvii, 2, pp. 241–247, 2 pl., 1930.

A brief account is given of a disease which is stated to have been first observed in 1924 in the Fuggles variety of hops in a hop garden of Worcestershire, since when it has slowly spread. It is mainly characterized by a weakened condition of the affected plants which produce markedly chlorotic and deformed foliage at the

start of the vegetation; later in the season, there is a tendency to form fresh shoots with normal leaves, but only a few healthy cones at the top of the bines, the yield of the diseased plants being considerably reduced.

Observations in 1928 and 1929 of diseased plants grown at the South-Eastern Agricultural College, Wye, showed that the first symptom in the spring was the formation on the primary leaves of pale yellow or pale greenish-yellow areas, primrose yellow by transmitted light. In slightly diseased leaves, the chlorosis was most commonly restricted to the extreme edge of the basal lobes of the lamina, but in more severe cases the yellow colour extended in a narrow band along the veins, sometimes entirely filling the interveinal space. The extent of attack varied considerably in individual leaves, but appeared to be determined at an early stage of development of the leaf, since it was never observed to extend in a fully expanded leaf blade. When the discoloration occurred near the margin of the leaf, it was usually associated with excessive or completely suppressed serration. Leaves with large chlorotic areas were very commonly distorted, and closely down-curled. Parti-coloured leaves were a frequent, though not a constant feature of the disease. The bines were thin and weak, but produced a small crop of hops. Lateral shoots developed normally in the axils of the primary leaves, and bore either healthy or diseased leaves. The chlorotic areas of the leaves were thinner than the green parts, and showed a great reduction in the number of chloroplasts in their cells.

Experiments in the transmission of the disease showed that it is transferable by budding, since a healthy plant of the Fuggles variety budded in 1928 with a bud from a chlorotic plant developed next year unmistakable symptoms [which are described in detail]. In 1928 14 scions from healthy Fuggles, Rodmersham Golding, and Tutsham plants, grafted on ten chlorotic plants, grew strongly (except one which died) and remained healthy throughout the season. In six similar grafts of the Fuggles variety in 1929, one out of four that survived developed the disease. Five chlorotic scions grafted on healthy plants of the same variety showed evident chlorosis in some of their lower leaves, but the later-formed leaves higher up the stems remained apparently healthy. Rubbing healthy leaves of the Mid-European Golding variety with juice from chlorotic leaves did not give any positive results during the 1929 season.

The authors consider that this disease belongs to the virus class. It resembles nettlehead [*R.A.M.*, iv, p. 634], both because it appears to spread from plant to plant slowly, and also because it does not kill the plant outright but allows it for a time to grow weak bines producing a few cones.

Lebedeva (Mme L. A.). Отчет по постановке опытов борьбы с грибными болезнями Хмеля в Костромской губ. в **1928** г. [Report on the technique of experiments in the control of fungal diseases of Hops in the Kostroma Government in 1928.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 1, pp. 48–89, 1929. [Received September, 1930.]

This is a detailed report of the author's investigation of the

powdery and downy mildews (*Sphaerotheca humuli* and *Pseudoperonospora humuli*) of hops in the Kostroma Government, an abbreviated account of which has already been noticed [*R.A.M.*, ix, p. 487]. The only additional point of interest is that the local green variety of hops with small cones proved to be practically immune from *S. humuli* and highly resistant to *P. humuli* in 1928, when both diseases were very severe on all other varieties, with the possible exception of another local, late-maturing variety [not named] which showed a comparatively high degree of tolerance to both mildews.

Barss (H. P.). **Downy mildew of Hops appears in Oregon.**—*Plant Disease Reporter*, xiv, 12, p. 98, 1930. [Mimeographed.]

A serious outbreak of downy mildew of hops (*Pseudoperonospora humuli*) [*R.A.M.*, ix, pp. 559, 677] is reported (9th June, 1930) from the central Willamette Valley of Oregon, the Early Cluster variety being chiefly affected while Fuggles is resistant. Two small acreages have been practically ruined and scattered infections occur elsewhere. The disease was first observed about a month previous to the date of this report. Attempts to control the disease by spraying with Bordeaux mixture are in progress.

McClean (A. P. D.). **Sugar-Cane diseases in South Africa.**—*South African Sugar Journ.*, xiv, 6, pp. 399–407, 1930.

In connexion with a general survey of the present situation in respect of sugar-cane diseases in South Africa [*R.A.M.*, ix, pp. 202, 678], the writer records the fact that outbreaks of mosaic have occurred on the following imported varieties established in open quarantine at the Experiment Station: D. 1135, Badila, 1900 Seedling, Q. 813, Gingor, Clarke's Seedling, U.D. 1, S.C. 12/4, and Co. 205. Several others became infected when grown alongside diseased plants on which *Aphis maidis* was present, but the following remained healthy under the same conditions: Wade's Selection, C.H. 64/21, Merthi, Zwinga, Hinde's Special, Co. 214, Co. 290, U.S. 663, P.O.J. 2727, P.O.J. 2725, and P.O.J. 2714.

Some 18 varieties, including Noble, Chinese, and North India types, have been found showing typical streak symptoms, including Uba, Oshima, Kavangire, Zwinga, C.H. 64/21, and Cuban Selection. The Javan varieties P.O.J. 2725, 2714, and 2878 have so far remained immune even in positions where 100 per cent. secondary streak infection may normally be expected within a year (Zululand and parts of Natal).

Zundel (G. L. I.). **Monographic studies on the Ustilaginales attacking Andropogon.**—*Mycologia*, xxii, 3, pp. 125–158, 1930.

In the course of a general study on the Ustilaginales, it was ascertained that 59 species had been recorded on the genus *Andropogon*. Through the co-operation of all available agencies the writer has been enabled personally to examine spores of nearly all these. Eighteen new species (eight of *Sorosporium* and ten of *Sphacelotheca*) have been determined, and English diagnoses are given of these as well as of 23 new combinations. In all, 76 species are recognized on *Andropogon*.

Ustilago consimilis Syd. is stated to occur on sorghum in Italy and the Philippine Islands; on *Imperata arundinacea* and *Erianthus saccharoides* in Natal; on *Saccharum fuscum* in India; on *S. spontaneum* in the Philippine Islands; and on sugar-cane in Natal, India, Japan, and the Philippine Islands. In a foot-note on p. 127 it is said that Sydow named the sugar-cane smut *U. consimilis*. [This is an error. The sugar-cane smut was named by Sydow *U. scitaminea*: cf. *R.A.M.*, iv, p. 127].

Tolyposporium filiferum Busse is referred to the genus *Sorosporium* and maintained as distinct from *S. ehrenbergii* without reference to the work of Patouillard and Mason [ibid., vi, p. 190], while *S. simii* is separated from *S. reiliana* without reference to that of Verwoerd [ibid., vi, p. 441].

Nyasaland is included in the Union of South Africa [p. 147]. The distribution of the various species given is incomplete in many cases.

Kern (F. D.) & Ciferri (R.). **Fungi of Santo Domingo.—III. Uredinales.**—*Mycologia*, xxii, 3, pp. 111–117, 1930.

The present paper, stated to be based chiefly on collections made by the junior author in 1929, contains 30 species of rusts, several of which are reported for the first time from the Dominican Republic, while in other cases new hosts and localities are cited [cf. *R.A.M.*, vii, p. 603].

Wolf (F. A.). **A parasitic alga, Cephaleuros virescens Kunze, on Citrus and certain other plants.**—*Journ. Elisha Mitchell Sci. Soc.*, xlv, 2, pp. 187–205, 5 pl., 1930.

The investigations described in this paper cover studies made in Florida of the parasitic alga, *Cephaleuros virescens*, well known in India, Ceylon, and Java [*R.A.M.*, iii, p. 478], on citrus and other trees and shrubs [which are enumerated] with coriaceous leaves.

The foliage is the primary point of attack, though the velvety, reddish-brown to orange, cushion-like patches, pigmented by haematochrome, also occur on the twigs and fruits. The thallus is endophytic, either subcuticular or subepidermal, excepting the very young thalli which, on *Magnolia grandiflora* (and probably the other hosts), are often wholly superficial. Once they are large enough to be visible to the naked eye, they are always subcuticular on *Magnolia*. Both stalked and sessile sporangia are formed and the cycle of development from zoospores to thalli which bear sporangia has been observed on *M. grandiflora* and occupies about eight months, a similar period apparently being required on grapefruit (*Citrus grandis*), sweet lemon (*C. limonia*), and tangerine (*C. nobilis* var. *deliciosa*).

Infection of *Magnolia*, and apparently also of citrus, occurs at the close of the rainy season on mature leaves. The alga is not usually associated with a fungus to form a lichen in Florida. *C. virescens* is dependent on its host for water and mineral salts only, and is therefore considered to be a 'water parasite'. The alga remains alive and forms successive crops of sporangia until after the shedding of the leaves. Frequent rains wash off the young superficial thalli, and apparently only those zoospores which

penetrate the cuticle through wounds produce lesions. No evidence was obtained that the uninjured cuticle could be penetrated. Inoculations on wounded and uninjured grapefruit leaves failed. In natural lesions on avocado, *Magnolia*, loquat (*Eriobotrya japonica*), and tea the tissues subjacent to the alga die without much cellular modification, whereas in citrus they are stimulated to the formation of wound cork. In culture on synthetic agar *C. virescens* forms a densely interwoven filamentous mass.

GADD (C. H.). **What is the Diplodia root disease of Tea?**—*Tea Quarterly*, iii, 2, pp. 44–48, 1930.

Recapitulating his views on the etiology of the so-called *Diplodia* root disease of tea (associated with the presence of *Botryodiplodia theobromae* [*R.A.M.*, viii, p. 677]), the writer distinguishes three forms of the malady, as described by Petch from Ceylon, viz. (1) in old tea after pruning (the most common); (2) in young tea after its first pruning and in nursery plants; and (3) in tea in full leaf (rare). Tunstall's statement [ibid., ix, p. 68] that in north-east India the disease is not correlated with the absence of starch, which is such a striking feature of the common condition in Ceylon, is regarded as evidence that the disease as known in India belongs to one or other of the rarer Ceylon types, or to some other, distinct, form.

BÖNING (K.). **Krankheiten, Schädlinge und Witterungsschäden am Tabak im Jahre 1929.** [Diseases, pests, and weather injuries to Tobacco in the year 1929.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, viii, 2, pp. 27–33, 1930.

Sporadic occurrences of tobacco wildfire [*Bacterium tabacum*] were observed in various localities of the Palatinate during the summer of 1929, but as in the previous year the damage from this source was relatively slight [*R.A.M.*, ix, p. 137]. A distinct correlation was noticed between the time of setting and the incidence of infection, which was considerably heavier in the late- than in the early-set crops. The possible bearing of weather and soil factors on this observation is briefly discussed, but further investigations are necessary to establish a definite connexion. In parts of Mittelfranken wildfire was very prevalent in the seed-beds, but the dry weather prevented any extensive spread in the field.

'Stem and rib scorch' [*Colletotrichum* sp.: loc. cit.] caused losses amounting to between 3 and 5 per cent. in a number of districts.

FUKANO (H.). **Effects of Tobacco mosaic upon the growth of Bac. aroideae Townsend, the cause of Tobacco hollow stalk.**—*Bull. Sci. Fukuoka Terkultura, Kjûsu Univ.*, iv, 1, pp. 45–51, 2 graphs, 1930. [Japanese, with English summary.]

According to present information, the causal agent of tobacco mosaic is distributed throughout the plant, with the exception of the seeds, and produces the characteristic physical and chemical changes in the host cells [*R.A.M.*, ix, pp. 413–414]. It was thought, therefore, that the growth of plant pathogens in mosaic plants might be accelerated or retarded by the infective principle,

and experiments were accordingly conducted to determine the action of the latter on *Bacillus aroideae*, the causal organism of hollow stalk [ibid., viii, p. 195]. It was found that the filtrate of mosaic tobacco leaves passed through a Berkefeld filter caused a marked acceleration of growth in this organism cultured in Czapek's solution as compared with filtrates from healthy leaves, and mosaic tobacco stems developed the symptoms of hollow stalk more rapidly than healthy ones, when inoculated with the organism.

FUKUSHI (T.). **Effects of certain alkaloids, glucosides and other substances upon the infectivity of the mosaic Tobacco juice.** —*Trans. Sapporo Nat. Hist. Soc.*, xi, 2, pp. 59–69, 1930.

The virus of tobacco mosaic [see preceding abstract] proved remarkably resistant to various kinds of alkaloids, salts of alkaloids, glucosides, and ethereal oils, when subjected to these chemical agents in the mosaic tobacco juice. It resisted a saturated solution of aconitine and nearly saturated solutions of morphine sulphate, strychnine sulphate, salicin (all at 2 per cent.), phloridzin (3 per cent.), brucine (1 per cent.), digitalin (2 per cent.), and amygdalin (5 per cent.) for five days. Mustard oil and digitalin (2 and 5 per cent., respectively) destroyed the virulence of the mosaic juice in five days. Nicotine (3 per cent.) caused a marked reduction in the virulence of the mosaic juice in three hours and destroyed it in 3 to 5 days, while the same effect was produced by atropine (1 per cent.) in 3 days and at 2 per cent. in 1 to 3 days. Saponin (2 per cent.) failed to reduce the infectivity of the virus, and even at 10 per cent. the latter was not completely destroyed in five days.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **Electrophoresis of Tobacco mosaic virus.**—*Hilgardia*, iv, 15, pp. 441-463, 1930.

After reviewing the existing literature relative to the nature of viruses in plants and animals, the authors describe experiments to determine the electrical charge of the tobacco mosaic virus, the results of which showed that the unpurified virus migrated to the anode in an electrical field at P_H values between 4 and 9; no migration occurred at P_H values between 3 and 1·2 [cf. *R.A.M.*, ix, p. 540].

The bibliography appended comprises 70 titles.

JARRETT (PHYLLIS H.). **Streak—a virus disease of Tomatoes.**—*Ann. of Appl. Biol.*, xvii, 2, pp. 248–259, 2 diags., 1930.

Details are given of experiments at Rothamsted on tomato streak [*R.A.M.*, ix, p. 415], including a comparative study of the disease as observed in commercial glasshouses in England and that produced experimentally by combined inoculation with the viruses of potato and tobacco mosaics. In a preliminary series of tests it was shown that both streak and coarse mottle or mosaic symptoms appear in tomato plants inoculated with natural streak, irrespective of whether the plants from which the inoculum is derived exhibit either symptom alone or both together in the same plant. Natural streak does not apparently contain the virus of potato mosaic, since inoculum obtained from naturally diseased plants produced

necrotic lesions identical with those of glasshouse tomato streak even after treatment with alcohol, heat, and storage *in vitro*, such as normally destroys the infectivity of potato mosaic virus. On the other hand, the complete agreement in such characters as host range, resistance to alcohol, heat, ageing *in vitro*, and the like, are strongly suggestive of the probability of the identity of the virus of tobacco mosaic and that of glasshouse tomato streak. It is believed that much of the streak occurring in glasshouses is due to this single virus, and not to a mixed infection with it and the potato mosaic virus.

Shapovalov (M.) & Jones (H. A.). **Changes in the composition of the Tomato plant accompanying different stages of yellows.** —*Plant Physiol.*, v, 1, pp. 157–165, 1930.

Chemical analyses [the technique of which is described and the results tabulated] of tomato plants suffering from yellows [*R.A.M.*, viii, p. 75] as an outcome of inoculation with the curly top virus of beet by means of the leafhopper *Eutettix tenella* [ibid., ix, p. 574] indicated that the changes accompanying the artificially induced external symptoms are essentially identical with those occurring in plants naturally affected in the field by the complex of symptoms formerly known as western yellow blight. Among these modifications the increase of dry matter and the accumulation of starch and sugars in the leaves and stems of inoculated and naturally infected plants appeared to be constant and should be regarded as diagnostic characters of the yellow disease. The fluctuations in the nitrogen content are variable. There is often a decrease of total nitrogen at the expense of its soluble fraction, especially in the leaves. The carbohydrate accumulation in the same plant is progressive, larger amounts of these constituents being definitely connected with more severe external symptoms. There was no essential difference between resistant and susceptible tomato strains as regards their response to yellows infection.

Small (T.). **Tomato leaf mould.**—*Fifteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1929*, pp. 43–51, 1930.

The data obtained in the course of a study on the relation of tomato leaf mould (*Cladosporium fulvum*) to environmental conditions [*R.A.M.*, vii, p. 750] indicate that epidemics of the disease in glasshouses are most liable to occur in rainy or cloudy weather, when humidity remains high both day and night, unless abnormally low temperatures prevail at the same time. Attacks of leaf mould appear to originate at night or early morning in fine weather, and at any time during the day or night under cloudy or wet conditions. The chief factor in the control of the fungus is the reduction of humidity during these periods.

Inoculation experiments have shown that infection may occur in darkness; that plants in open, dry glass tanks suffer more severely than those outside; that *C. fulvum* may attack flower trusses and cause a serious reduction of yield; that the disease may affect outdoor crops (this being also observed under natural conditions in South Devon), that well-manured plants are more susceptible than starved ones; and that leaves of various ages

are equally liable to infection. Attempts to produce infection by *C. fulvum* on other plants by means of inoculation gave negative results.

The spores of *C. fulvum* can overwinter on diseased leaves, on glasshouse structures, and in the soil; experimental evidence suggests that cresylic acid emulsion or burning sulphur may be of use in cleaning glasshouses prior to planting.

Vanine (S. I.). Главнейшие грибные болезни Бузулукского бора Самарской губернии. [Chief fungal diseases of the Bouzoulouk forest in the Samara Government.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 1, pp. 238–255, 2 figs., 1 map, 1929. [Received September, 1930.]

The results of a phytopathological survey in 1926 and 1927 of the extensive Bouzoulouk forest in the Samara Government [east Russia] showed that the most widespread disease of older stands of conifers was heart rot caused by *Trametes pini*, which in some places affected 68 per cent. of the trees. Considerable space is given to a discussion of the spread of the rot inside the trees and of the injury it causes to the timber, as well as of the measures that should be applied for its eradication. No direct correlation was noted between the incidence of the fungus and environmental conditions, but there were indications that it occurred somewhat more frequently in mixed stands, where conditions of growth were more favourable. Younger stands of conifers suffer rather severely from attacks of *Phacidium infestans* which, in some places, kills large numbers of one- to three-year-old trees [*R.A.M.*, viii, p. 475].

The chief diseases of broad-leaved species in the forest are *Fomes igniarius* on the aspen [ibid., viii, p. 411; ix, p. 568], and *Polyporus dryophilus* (usually described from Russia under the name *P. dryadeus*) [ibid., vii, p. 415] on oak.

May (C.). **Dutch Elm disease in Ohio.**—*Science*, N.S., lxxii, 1858, pp. 142–143, 1930.

The typical symptoms of the Dutch elm disease [which are very briefly described] have been found in Ohio. The fungus isolated from the discoloured wood produced a greyish-white, somewhat sparse, adpressed, zonate mycelium on acidified potato agar. Conidia measuring about 3·5 by 1·5 μ were produced in heads on branched conidiophores; budding took place in many cases. Coremia with spores measuring about 3·3 by 1·7 μ were formed on the fragments of wood and on the agar. Dr. C. Buisman, of Holland, now at the Arnold Arboretum, identified the organism as *Graphium ulmi* [*R.A.M.*, ix, p. 499], which is behaving as a virulent parasite in the elms under observation.

Waldie (J. S. L.). **An Oak seedling disease caused by Rosellinia quercina Hartig.**—*Forestry*, iv, 1, pp. 1–6, 1 pl., 1930.

In June, 1927, oak seedlings at Kennington Nursery, near Oxford, were found to be dying off in patches as a result of infection by *Rosellinia quercina*, a fungus hitherto recorded only once in England (*Journ. of Botany*, l, p. 185, 1912). In 1928 and 1929 the disease recurred in the same nursery in a milder form,

while in the latter year it was also observed on direct-sown oak seedlings in the Forest of Dean.

The first symptom of infection was a blue-green, later yellow, discoloration of the topmost leaves, which subsequently extended to the lower parts of the seedlings. The disease usually spread outwards from a small centre. The tap-roots of affected seedlings were rotted, but in some of the seedlings a new root system was more or less successfully developed from the upper part of the root, which ended in a decayed stump two or three inches below soil level. Between the bark and the wood of the diseased roots was a white mycelium, accompanied by a felt of violet-brown hyphae on the outside of the upper, still living, part of the root.

During the summer the infection spreads principally by the mycelium in the soil, the disease extending radially in every direction from the centre of infection when the acorns are sown broadcast, while if they are sown in drills the fungus works along the lines.

In its early stages the mycelium of *R. quercina* consists of hyaline, septate hyphae, 4 to 7 μ in diameter, which later become branched and anastomose or form thick strands by fusion, eventually developing an irregular web and gradually turning brown (usually after 14 days). Small, upright conidiophores, with verticillate branches budding off simple, short conidia, are found in the summer among the hyphae round the collar of the seedlings and growing over the surface of the soil. About the middle of September the formation of small, black, ostiolate perithecia, 0·8 to 1 mm. in diameter, was observed in the thick felted mycelium on the stem immediately above soil level, and also on the surface of the soil surrounding the diseased plants. The asci are 180 by 10 μ in diameter at maturity, and are accompanied by septate, cylindrical paraphyses, about 210 by 3 μ. The ascus contains eight brown, fusiform ascospores, measuring about 30 by 8 μ, and bearing on the flatter and shorter side a fine line extending three-quarters of the way along the spore. They are fully formed by the end of October, but do not escape from the perithecium until the following spring.

R. quercina may be disseminated in the spring by germinating ascospores or by a resting mycelium, which may take the form of small sclerotia. During the summer the mycelium may spread over an area of about one square yard, while the dispersal of the conidia by wind and rain may also contribute to dissemination. The hyphae penetrate the seedlings through the young lateral roots unprotected by periderm, and then through the wounds left by the death of these roots. In cases of severe infection the root is hollowed out and only the bark remains. At the open wounds referred to above, the fungus forms dark-coloured, sclerotium-like mycelial outgrowths, which send out processes into the root tissues. Should conditions unfavourable to the parasite arise, a cork barrier is formed by the host tissue round these dead root points, so that the fungus cannot penetrate the larger roots and further injury is obviated.

The disease was found to attack seedlings of the sessile oak (*Quercus robur sessiliflora*), the pedunculate oak (*Q. robur pedun-*

culata), and the Turkey oak (*Q. cerris*). Oak transplants and the seedlings of other deciduous trees grown in close proximity to diseased individuals remained healthy at Kennington.

Good control of the disease was effected by burning over the soil to a depth of six inches or more with a powerful blow-lamp, after which a 5 per cent. solution of carbolic acid was applied at the rate of 2 galls. per sq. yd.

Orton (C. R.). **Black Walnut canker.**—*Science*, N.S., lxxii, 1858, p. 142, 1930.

Black walnuts (*Juglans nigra*) in the north-central part of West Virginia showed the presence, in the autumn of 1929, of conspicuous 'cat-faced' cankers, composed of very prominent rings of callus tissue, on the trunks and larger branches. A species of *Nectria* was found on many of the callus rings. The rough margins of the cankers, consisting of the last formed and largest roll of callus tissue, together with the attached bark, present a characteristic flaring appearance with a diameter usually exceeding that of the trunk or limb at the point of canker formation. The fact that some trees adjacent to the diseased individuals show no trace of infection seems to point to an inherent difference in susceptibility among trees of similar ages in the same stand. The general aspect of the cankers is suggestive of European canker [*N. galligena*], occurring in the United States on apple [*R.A.M.*, vi, p. 167] but apparently not hitherto reported on black walnut, the valuable timber of which is rendered practically worthless by the disease.

Demaree (J. B.) & Cole (J. R.). **Pecan leaf blotch.**—*Journ. Agric. Res.*, xl., 9, pp. 777–789, 5 figs., 1930.

A comprehensive account is given of the leaf blotch of pecans [*Carya pecan*] and *Hicoria* spp. in the southern United States, due to *Mycosphaerella dendroides* (Cke) comb. nov. (*Sphaerella dendroides* Cke., not Schw.). The pycnidial form of the fungus is thought to be possibly identical with *Phyllosticta convexula* reported by Bubák as occurring in association with the immature perithecia of a *Mycosphaerella* [*R.A.M.*, vii, p. 254]. The conidial stage appears to be identical with *Cercospora halstedii* Ell. & Ev. The genetic relationship of the conidial and perithecial stages [which are fully described] is demonstrated by their joint occurrence on the same lesions, by the similarity of cultures from conidia and ascospores, and by the production of similar conidia and pycnidia in cultures from either conidia or ascospores.

The most conspicuous symptom of infection by *M. dendroides* is the presence of groups of pycnidia and immature perithecia on the under sides of the leaf blades. The asci mature on the fallen leaves during the spring.

Preliminary experiments near Cairo, Georgia, indicated that leaf blotch may be effectively controlled by four or five applications of a monohydrated copper sulphate and lime dust (20–80), the midsummer treatments being the most important. Good results have also been obtained with three applications of Bordeaux mixture.

RABBAS (P.). **Die Kohlhernie und ihre Bekämpfung.** [Club-root of Cabbage and its control.]—*Ratschläge für Haus, Garten, Feld*, v, 5, pp. 54–55, 2 figs., 1930.

Popular notes are given on the control of club-root of cabbage (*Plasmodiophora brassicae*) by liming the soil (1 kg. quicklime per sq. m.); disinfection of the soil with uspulun dust (75 gm. per sq. m.); dipping the roots up to the collar in a mixture consisting of 1 teaspoonful of uspulun, 5 teaspoonfuls of solbar, 1 l. of water, and clay; and disinfecting the plant holes with a 0·25 per cent. uspulun solution (¼ l. per hole) [*R.A.M.*, viii, p. 5].

Legislative and administrative measures. France.—*Internat. Bull. of Plant Protect.*, iv, 6, pp. 89–90, 1930.

In order to protect sugar-cane in the French colonies against plant and animal parasites, especially mosaic and Fiji disease [*R.A.M.*, viii, p. 809], the Minister for the Colonies has issued a Decree (3rd December, 1929) prohibiting the importation into, and circulation, storage, and transit within, the French Colonies (other than Indo-China) of setts or seeds of sugar-cane from any source, except under certain specified conditions [which are defined]. Suspected consignments will either be returned to the owner (at his expense) or confiscated and burnt, while those admitted will be kept under observation by the local agricultural service for a minimum period of three months.

Legislative and administrative measures. France.—*Internat. Bull. of Plant Protect.*, iv, 6, pp. 90-91, 1930.

A Decree of 3rd December, 1929, prohibits the importation into, and circulation within, certain French colonies [West African, West Indian, Pacific, Madagascar, etc.] of cacao plants (including pods and seeds) from countries harbouring the disease known as witches' broom (*Marasmius perniciosus*) [*R.A.M.*, ix, p. 232], viz., South and Central America and Trinidad. The importation of cacao plants from countries other than those referred to above will be permitted only on the production of duly authenticated certificates vouching for the safe origin of such plants. All imported cacao plants failing to conform to the above requirements will be returned to the owner (at his expense) or confiscated and burnt. Cacao plants admitted into the French colonies under exceptional conditions by permit from the Minister for the Colonies from the contaminated countries will be kept under observation by the local agricultural service for a period of two months.

Secondary leaf-fall of Rubber—a notifiable disease.—*Malayan Agric. Journ.*, xviii, 6, p. 308, 1930.

By notifications in the Straits Settlements and Federated Malay States Government Gazettes in May, 1930, secondary leaf fall of rubber (*Oidium heveae*) becomes a notifiable disease under the Pest Notification Rules of 1925 and 1927 [*R.A.M.*, iv, p. 768] and must be reported to the agricultural officer concerned within two weeks of its discovery; similar action is under consideration in Johore.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

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BROWN (J. G.). **Timber-rot in the Pepper-tree, Schinus molle.**—*Arizona Agric. Exper. Stat. Bull.* 132, pp. 443-454, 8 pl., 1 fig., 1 diag., 1930.

Pepper trees (*Schinus molle*), which are extensively grown in Arizona for shade and ornamental purposes, are liable to timber rot caused by *Inonotus schini* [*R.A.M.*, ii, p. 49]. The fungus is characterized by simple or imbricate, ungulate and dimidiate, or irregular sporophores, snuff-brown above and russet below, measuring on an average 10 to 12 by 4 to 8 by 1·5 to 4 cm.; sayal-brown to snuff-brown (Ridgway) tramae averaging 108 μ in thickness; 4- to 6-sided angular pores, 2 to 4 per mm.; and smooth, oval, light brown spores measuring 6 to 9 by 4·5 to 6·9 μ (average 6·9 by 5·4 μ).

The first symptom of the disease is the progressive wilting of the leaves and death of the upper branches. Later there may be a rapid growth of young branches from the lower part of the trunk. Large branches originating at a distance below the infection in the trunk may remain alive for months or even years after the death of the top. Sections through diseased branches show a dark brown discoloration of the pith, where infection progresses more rapidly than in the xylem. Numerous hyphae occur in the cells of the wood, even in its outer part. Hyphae were not actually observed in the living elements next to the cambium, but the many hypertrophies in diseased trees and the frequent death of the cortex suggest that the fungus may invade the cambium and the tissues external to it.

Since *I. schini* appears to enter the trees exclusively through wounds, great care should be taken in pruning operations. Branches of trees damaged by wind and frost should be carefully pruned and the cut surfaces painted. The early excision of infected branches may save further injury to the trees.

ARNAUD (G.) & BARTHELET (J.). **Le dépérissement des Ailantes et le Verticillium dahliae Klebahn.** [The dying-off of *Ailanthus* trees and *Verticillium dahliae* Klebahn.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 5-6, pp. 227-230, 1930.

A brief account is given of a disease of *Ailanthus* trees in thoroughfares and public parks in Paris, which was first noticed about 1917 and which since has killed a considerable number of

the trees. A constant feature of the disease is a dark yellow discoloration to a depth of 5 to 10 mm. of the outer wood on one side of the trunk, and the presence in the vessels of the affected wood of mycelium which, in some cases, may extend along the whole length of the tree, from the roots to the finer twigs on the diseased side. Isolations proved the mycelium to be that of *Verticillium dahliae* [*R.A.M.*, ix, p. 256]. Successful wound inoculations indicated that the fungus is pathogenic to sycamore (*Acer pseudoplatanus*), potato, and *Ailanthus*, on which the symptoms noted in nature were reproduced, but there are still many points of the parasitic activity of the fungus which remain obscure.

FISCHER (E.). **Über einige Kleinarten von Gymnosporangium und ihre Einwirkung auf den Wirt.** [On some subspecies of *Gymnosporangium* and their effect on the host.]—*Zeitschr. für Bot.*, xxiii, pp. 163–182, 2 figs., 1930.

Gymnosporangium gracile and *G. clavariaeforme* are stated to be barely distinguishable on the basis of aecidial host selection (except possibly in regard to *Cydonia*) and morphological characters, whereas they are sharply differentiated by the action of their diplont, which produces witches' brooms, on *Juniperus oxycedrus*, only in the case of *G. gracile* [*R.A.M.*, ix, p. 572].

G. confusum [ibid., vii, p. 813] comprises the following subspecies ['Kleinarten'], viz., the form on *J. sabina*, which produces galls on *Crataegus oxyacantha* and *Cydonia vulgaris* and develops aecidia on these hosts; that on *J. phoenicea* (possibly identical with *G. tauricum*), which corresponds morphologically with the foregoing and also infects *Crataegus*, but seldom produces galls and aecidia on *Cydonia*, its effects being more of a toxic character; and the forms on *J. oxycedrus*, which appear to belong to two subspecies of the *G. confusum* type, namely, one (possibly identical with *G. oxycedri*) which does not induce polycladia but forms aecidia on *Crataegus* and causes toxic manifestations in *Cydonia*, and a second which does induce polycladia in these hosts but failed in the writer's experiments to form aecidia.

The divergent effects of the species of *Gymnosporangium* under discussion may be attributed to genotypic differences in their virulence, while the varying reaction of *Cydonia* and *Crataegus* to the same species (*G. confusum* on *J. phoenicea* and *J. oxycedrus*) is conditioned by genotypical variations in the degree of immunity of the two hosts.

FRITZ (CLARA W.). **A new method of sterilizing wood blocks to be used for the culture of wood-inhabiting fungi.**—*Phytopath.*, xx, 5, pp. 449–450, 1930.

The technique of a new method of sterilization of the surface of wood blocks by exposure for six hours to the fumes of glacial acetic acid and subsequent transfer to a dry sterilized vessel until the fumes can no longer be detected, then washing in distilled water, is explained. This process has been found superior to sterilization by heat, which causes changes in the chemical composition of the wood and thus alters the food supply of any fungus with which it may be inoculated.

Holmes Smith (E.). **Control of club root and root maggot.**—*Gard. Chron.*, lxxxvii, 2263, pp. 371–372, 5 figs., 1930.

Very satisfactory results in the combined control of club-root (*Plasmodiophora brassicae*) and root maggot (*Chortophila brassicae*) of cabbage, cauliflower, and other species of *Brassica* [*R.A.M.*, ix, pp. 218, 700, 752] was given in Lancashire during 1929 by the following methods. Before sowing the seed, corrosive sublimate (1 in 2,000) should be applied to the soil in the drills at the rate of 1 pint to every 5 ft. of drill. When the seedlings are about 2 inches high, a second application of the same solution, at the rate of 1 quart per 5 ft. of drill, should be given to the soil between the drills, care being taken to avoid wetting the plants. A third application, at the same rate as the second, should be given to the soil between the drills the day before transplanting the seedlings. At planting out, each dibbled hole should be filled up twice with the solution (about half a pint in all), which should be allowed to drain away before inserting the seedlings. Out of 981 cauliflower plants treated by this method, 957 or 97·6 per cent. were cut for market, and of these 902 (94·3 per cent.) were graded as first class. Out of 192 untreated cauliflower plants, only 84 (44·2 per cent.) were marketable. Similar results were obtained with cabbage. Directions are given for the preparation of the corrosive sublimate solution.

Afsvampning af Kaalroefrø. [Disinfection of Swede seed.]—*Ugeskr. for Landmaend*, lxxv, 13, p. 200, 1930.

In connexion with the severe epidemic of dry rot of swedes [*Phoma lingam*] during 1928 in Denmark [*R.A.M.*, viii, p. 752], the phytopathological authorities instituted a series of laboratory and field experiments in seed disinfection. Good results were obtained by 30 minutes' immersion in water, followed by one hour in 0·5 per cent. uspulun, at the rate of 2 l. per kg. seed.

Fajardo (T. G.). **Studies on the mosaic disease of the Bean (Phaseolus vulgaris L.).**—*Phytopath.*, xx, 5, pp. 469–494, 6 figs., 2 diags., 1930.

A full account is given of the writer's investigations, conducted at Madison, Wisconsin, on bean (*Phaseolus vulgaris*) mosaic [*R.A.M.*, ix, p. 423], especially on natural and artificial transmission of infection.

The symptoms of the disease [which are described] appear in a pronounced form at 20° to 28° C. with an incubation period of 8 to 15 days; at 28° to 32° partial masking occurs and the incubation period is prolonged, while at 12° to 18° total masking takes place.

It would appear, from observation and experimental evidence, that there is only one kind of bean mosaic, the disease being limited to this particular host. The virus seems to be present in all the aerial vegetative parts of mosaic plants, but in the seed it appears to be confined to the embryo.

It was found impossible to transmit bean mosaic through the soil or by contact between the roots or aerial parts of infected and healthy plants. Leaf-mutilation inoculation, however, has given

80 to 100 per cent. of infection in the majority of cases. The leaves are rubbed on the upper surface along the midrib with a small piece of cheesecloth dipped in infective expressed juice to which a small quantity of sand has been added. Satisfactory results were also obtained by rubbing the leaves with mosaic tissues which were ground up, mixed with sand, and rolled into small balls. Inoculation through cut roots produced infection in a small percentage of cases, but negative results were given by the immersion of healthy seed in the expressed juice of diseased plants. Successful transmission of the virus has been effected by the aphids, *Aphis rumicis*, *Myzus persicae*, and *Macrosiphum solanifolii* [*M. gei*], and by a species of mealy bug. Fifteen or more infected aphids per plant gave a higher percentage of mosaic than where fewer were used, although in some cases infection was caused by a single viruliferous individual of either *A. rumicis* or *Myzus persicae*.

Bean mosaic is usually transmitted through the seed, and is believed to be carried over from one season to another only in diseased seed. A wide difference in the amount of seed transmission has been observed between early and late varieties commercial seed of the latter having been found to produce up to 60 per cent. infection. Seeds from plants infected during the current season do not all show mosaic, which may develop in some seeds of an individual pod and not in others. The percentage of seed infection is correlated with the stage of the plant at which the attack occurs, decreasing as the flowering period is approached. No infection is shown by plants attacked after the blossoms are set. The presence of the virus does not appear to affect the viability of the seed. The date of planting has been found to influence the amount of seed transmission in a given variety. Early varieties planted early are more likely to escape seed infection than late ones, while both kinds, planted between 20th and 25th May, showed less than those planted on or after 10th June.

The spread of field infection by mosaic may be greatly reduced by planting early enough to permit the plants to complete their growing period and reach the flowering stage before aphids become abundant.

Apart from the highly resistant Robust variety, all the commercial beans tested proved more or less susceptible to infection and showed leaf symptoms of different degrees of severity.

Control measures should include the use of disease-free seed and the development of early-maturing varieties combining resistance with productivity.

JENKINS (ANNA E.). **A scab disease of Lima Bean in Cuba and Porto Rico.**—*Plant Disease Reporter*, xiv, 11, pp. 96–97, 1930.

Lima beans (*Phaseolus lunatus*) in Cuba and Porto Rico are stated to be affected by a destructive disease known as scab, the causal organism of which, formerly thought to be *Colletotrichum lindemuthianum*, has now been identified as *Elsinoe canavaliae* Rac. [*R.A.M.*, ix, p. 66], hitherto recorded only on *Canavalia* from the East. The fungus produces numerous thickened vinaceous-buff lesions, up to 1 cm. in length, on the leaves, stems, and fruits.

On the pods these spots are very conspicuous. Infection is known to have been introduced on Cuban shipments of green unshelled Lima beans into the United States, where it does not appear, however, that the disease has become definitely established.

RAMBOUSEK (F.). **Schädlinge und Krankheiten der Zuckerrübe im Jahre 1929.** [Pests and diseases of the Sugar Beet in the year 1929.]—*Zeitschr. für Zuckerind.*, liv, 39, pp. 433–442, 5 figs., 1930.

A physiological disease of sugar beets was very prevalent in Czecho-Slovakia during 1929, and is attributed to the sudden change of weather from heavy rain to excessive heat after late sowing. This disease (termed 'blight') was most in evidence in fields with incrusted soils and was a constant forerunner of heart rot [see next abstract].

Cercospora beticola was the most common leaf disease, being frequently observed during the autumn. In some localities, especially of Slovakia, the fungus caused considerable reductions of yield [*R.A.M.*, ix, p. 154] without, however, assuming an epidemic character.

Ramularia betae and *Peronospora schachtii* were widespread.

Two hitherto unknown diseases were observed. The first is characterized by small red spots on the yellow leaves, and the other by large white lesions surrounded by a silvery-white halo.

GÄUMANN (E.). **Untersuchungen über die Herzkrankheit (Phyllonekrose) der Runkel- und Zuckerrüben II.** [Investigations on the heart rot (phyllonecrosis) of Fodder and Sugar Beets. II.] —*Landw. Jahrb. der Schweiz*, xliv, 2, pp. 143–150, 1930.

Continuing his investigations on the heart rot of fodder and sugar beets in Switzerland [*R.A.M.*, iv, p. 521], the writer found that the disease occurs exclusively on neutral and alkaline soils. Where the hydrogen-ion concentration of the soil falls below P_H 7·8, the incidence of heart rot is usually too high to admit of profitable beet cultivation. The susceptible Klein-Wanzleben sugar variety contracts the disease at P_H 7 to 7·2 [ibid., ix, p. 502], while the highly resistant Andelfingen fodder beets were found to remain healthy at P_H 7·6. Some degree of control, therefore, may be achieved by the cultivation of resistant varieties on soils with a critical reaction.

The results [which are tabulated] of experiments in the control of heart rot by the application of different fertilizers showed uniformly beneficial results from liquid manure (with and without the admixture of dung), the sugar yield per hect. being raised as follows in five different tests: from 31·25 to 51·12 quintals (Kleinwanzlebener), 33·28 to 56·80 (Halbzucker), 41·28 to 52·80 (same, limed plot), 27·41 to 43·09 (Eckendorfer fodder), and 30·42 to 40·93 (same, limed plot). A heavy increase of infection uniformly followed the omission of nitrogen from the fertilizer (37·7 to 59·1, 12·5 to 45·8, 18·1 to 62·5, 5·6 to 48·6, and 12·5 to 55·5 per cent., respectively, in the five series enumerated above). The effects of combined fertilizers were found to vary according to the type of soil and variety of beet.

Esau (Katherine). **Studies of the breeding of Sugar Beets for resistance to curly top.**—*Hilgardia*, iv, 14, pp. 415–441, 1 pl., 8 figs., 1930.

Extensive tests [details of which are given] at Davis and King City, California, are stated to have shown the resistance of the P-19 strain of sugar beet, selected by the Spreckels Sugar Company in the Salinas Valley in 1919, to curly top [*R.A.M.*, ix, p. 425]; complete immunity was not observed, but, as a rule, the disease was only marked by a slight degree of transparent venation. This strain, however, has no commercial value owing to various undesirable characters, namely, low viability of seed, low sugar content, poor vigour, and undesirable root shape. Encouraging results have been obtained by hybridization between P-19 and a beet of the strain 651–3 which is characterized by a prolific yield and high sugar percentage. The hybrid progenies showed a marked degree of resistance to curly top, though they were less uniform in this respect than P-19.

Mass selection of resistant mother beets found in the commercial plantings gave markedly resistant progenies which contained as high a percentage of sugar as the commercial controls with which they were compared.

Woodward (R. C.) & Dillon Weston (W. A. R.). **Treatment of Sugar Beet 'seed' to prevent seedling diseases.**—*Ann. of Appl. Biol.*, xvi, 4, pp. 542–566, 1 pl., 3 graphs, 1929.

This is the full report of the authors' tests of various preparations for the control of blackleg of sugar beet (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) [*R.A.M.*, viii, p. 543]. In addition to the information already noted, it is stated that the proprietary organic mercury compound [germisan] mentioned in the previous paper was definitely shown to have a beneficial action not only on the density of stand but on the vigour of young plants and also on their green and dry weight. A proprietary dusting powder was nearly as efficient. Steeping in a 0·5, or sprinkling with a 3·5 per cent. carbolic acid solution was ineffective in the control of the disease and was sometimes definitely injurious to the seed. Treatment of the seed clusters with 60 per cent. sulphuric acid did not appreciably improve the density of stand, but when this treatment was followed by an application of the organic mercury preparation, the number of plants was considerably increased.

It is stated that certain samples of commercial sugar beet seed supplied as having been treated with a mercury compound were found to be still heavily infected with *Phoma betae*, a fact which suggests the necessity of carefully re-treating such material.

Angell (H. R.), Walker (J. C.), & Link (K. P.). **The relation of protocatechuic acid to disease resistance in the Onion.**—*Phytopath.*, xx, 5, pp. 431–438, 1930.

The outstanding features of the authors' investigations on the relation between the protocatechuic acid content of red and

yellow onion bulbs and smudge (*Colletotrichum circinans*) resistance have already been summarized from other sources [*R.A.M.*, ix, p. 284].

LABROUSSE (F.). **Influence de la fumure sur la résistance d'une variété de Laitue à la maladie du collet causée par le Sclerotinia libertiana.** [Influence of manure on the resistance of a variety of Lettuce to the collar rot caused by *Sclerotinia libertiana*.]—*Rev. Path. Vég. et Ent. Agric.*, xvii, 5–6, pp. 222–226, 1930.

Cold frame and pot experiments in 1928 and 1929, in which seedlings of the Batavia variety of lettuce inoculated with pure cultures of *Sclerotinia libertiana* [*S. sclerotiorum*] were grown in variously fertilized soil, showed that the mortality of the seedlings was reduced from 100 to about 50 per cent. or less in the series that had been supplied with a well-balanced mineral fertilizer (1 gm. each of N and P_2O_5 and 1 or 2 gm. of K_2O per 10 kg. of soil). These results are interpreted as indicating that the nature of the manure applied has a marked bearing on the resistance of this variety of lettuce to the collar rot caused by *S. sclerotiorum*.

RODIGIN (M.). К вопросу о способах распространения Тыквенного антракноза. [On the question of the methods of spread of anthracnose of Cucurbitaceae.]—*Опытн. Агрон. Ю.-В.* [*South-Eastern Exper. Agron.*], Saratoff, viii, 1, pp. 221–226, [? 1930]. [Received August, 1930. English summary.]

Details are given of experiments carried out in 1928 and 1929 in the Lower Volga basin to determine the methods of overwintering and of spread in the spring and summer of anthracnose (*Colletotrichum* [*lagenarium*]) of Cucurbitaceae. Artificially produced sclerotia of the fungus [*R.A.M.*, viii, p. 624], enclosed in test-tubes and left over winter buried in snow in the field, were found in the spring either to have germinated or to have been transformed into pycnidia with well cutinized walls and containing a large number of spores. Inoculation of watermelon fruits in the summer of 1929 (which was exceptionally hot and marked by the total absence of the disease in the region) with spore suspensions of *C. lagenarium* gave rise to two different types of infection; on some varieties normal pinkish sporodochia were formed, while on others the lesions took the form of dark coloured, sclerotium-like cushions which under the microscope appeared as partly developed subepidermal pycnidia. In the author's opinion, these results suggest that, although sclerotia of the fungus have not yet been found in nature, they may be formed on the débris of cucurbits remaining in the field, as a result of exposure to both very hot and very cold weather. This would, in a great measure, explain the persistence of the disease in the soil from year to year. No evidence was obtained that infection is transmitted by the seed.

Observations indicated that the two main factors involved in the spread of the disease during spring and summer are wind and insects (e. g., the beetle *Pimelia capito*), and that its development is favoured by abundant dews or thick drizzle during still, warm weather; heavy rains tend to wash the spores from the upper sur-

face of the fruits, and to favour the development of rot on the surface lying on the ground, where the spores collect in considerable numbers.

CHEVALIER (A.). **Sur la mycocécidie du gynophore de l'Arachide.** [On the mycocecidium of the gynophore of the Groundnut.]—*Comptes rendus Acad. des Sciences*, cxci, 4, pp. 222–224, 1930.

The author states that as long as the gynophore of the groundnut [*Arachis hypogaea*] remains aerial it preserves a cylindrical shape, but as soon as it enters the soil, the underground portion invariably forms a fusiform thickening a few millimetres behind the growing point; about the time of maturation of the fruit, this spindle measures from 5 to 30 mm. long, and begins at 0·5 to 1 cm. below the surface of the ground. It is covered with a mat of thin hairs which agglomerate particles of sand or humus, and which are surrounded by fungal hyphae. Some of the latter penetrate the underlying cells of the host, causing a process of suberisation and the development under the epidermis of a layer of 5 or 6 rows of hypertrophied parenchymatous cells. The invasion of the gynophore by the fungus [no description of which is given] starts by the formation of small, raised pustules, 1 to 2 mm. in diameter, at first separated but later joining together to form a continuous spindle. The latter is interpreted by the author as an obligatory symbiotic mycocecidium which allows the plant to fix nitrogen and to store water from the soil for its future needs during periods of drought.

NAGORNY (P. I.). **Микофлора Кавказской Виноградной лозы.** [The fungal flora of the Vine in the Caucasus.]—*Travaux Jard. Bot. de Tiflis*, Tiflis, Ser. II, v, iii + 207 pp., 6 pl., 65 figs., 1930.

In the preface [a German summary of which is appended] to this important monographic study of the fungal flora of the vine in the Caucasus, the author states that the work is the outcome of 15 years' investigations by him, and is based both on his own collections and on the material gathered during the last forty years in the various local herbaria. The book gives descriptions and diagnoses [both in Russian and in German] of 106 species of parasitic, suspectedly injurious, and saprophytic fungi, arranged in systematic order, a good many of which have already been noticed in this Review [*R.A.M.*, ix, p. 14 *et passim*]. A large number of the figures are original, and the explanations appended to them are bilingual, as is also a synoptic table at the end of the volume, which gives the macroscopical symptoms induced by the principal pathogens of the vine.

While a few of the more important diseases (e.g., *Plasmopara viticola*, *Uncinula necator*, *Rosellinia necatrix*, and the like) are dealt with fairly fully, the biology of the great majority of the fungi described is reserved for a further publication. The author states that he was not able to verify the synonymy of all the organisms, partly because of lack of original material in the her-

baria examined by him, as for instance in the case of all of the new species established by Speschneff and Sorokin.

A bibliography of 405 titles terminates the volume.

Hengl (F.). **Vergleichende Versuche gegen pilzliche Rebenschädlinge in den Jahren 1928 und 1929.** [Comparative tests in the control of fungous pests of the Vine during the years 1928 and 1929.]—Reprinted from *Das Weinland, 1930*, 6, 5 pp., 1930.

The results of comparative tests in 1928 and 1929 of the efficiency of various fungicidal preparations in Austria, made on the same lines as in previous years [*R.A.M.*, viii, p. 85], showed that a 2 per cent. solution of funguran with the addition of an equal quantity of quicklime was almost as effective against downy mildew of the vine (*Peronospora* [*Plasmopara*] *viticola*) as 1·5 per cent. Bordeaux mixture; it also gave good control of the *Pyralis* moth [*Sparganothis pilleriana*], and its preparation is much simpler than that of Bordeaux mixture with Paris green, its only drawback being its considerably higher cost. The new spray materials of the Chemical Works in Oderberg, namely Cu-1929 and Cu-As-1929, were not satisfactory. Promising results were obtained with the copper-arsenic preparation nosprasit of the I. G. Farbenindustrie A.-G., both as spray, and as dust for combined treatment with Bordeaux spray.

Oidium [*Uncinula necator*] outbreaks were very few and mild in Austria in both years, so that no judgement could be formed of the comparative efficacy of the preparations tested for its control.

Ravaz (L.). **Sur le court-noué.** [Concerning 'court-noué'.]—*Ann. École Nat. d'Agric. Montpellier*, N.S., xx, 2, pp. 110–125, 3 col. pl., 5 figs., 1930.

After a brief outline of the geographical distribution in various countries of the court-noué disease of the vine [*R.A.M.*, ix, p. 503], the author discusses in some detail the various theories advanced to explain its cause, and produces evidence to support his belief in the parasitic nature of the trouble [ibid., viii, p. 13]. Reference is also made to a few laboratory and field experiments which indicate that a measure of control may be attained by disinfection of the soil in affected vineyards with carbon disulphide or formaldehyde, and also by applications of lime at high doses.

[This paper is reproduced *in extenso* (but with only one coloured plate) in *Prog. Agric. et Vitic.*, xciii, 20, pp. 469–471; xciv, 31, pp. 105–111; 36, pp. 227–233, 1930.]

Ravaz (L.). **Chronique : Le mildiou.** [Current events : Mildew.]—*Prog. Agric. et Vitic.*, xciii, 18, p. 421, 1930.

The author states that the outbreak of mildew [*Plasmopara viticola*] forecast by him in his last note [*R.A.M.*, ix, p. 430] for the middle of May in the neighbourhood of Montpellier did not materialize, owing to the cold weather at that time. Since, how-

ever, the weather continues to be rainy, with warm spells, a second invasion should be on its way, and a thorough treatment of the vineyards with Bordeaux mixture is imperative.

MANZONI (L.). **Relazione sul funzionamento degli osservatori antiperonosporici della Provincia di Treviso per l'anno 1929.** [Report on the activities of the anti-mildew observatories in the Province of Treviso for the year 1929.]—*Annuario Staz. Sper. di Vitic. di Conegliano*, iii, 2, *1929–1930*, 18 pp., 1930.

In May, 1929, seven experimental forecasting stations similar to those existing in Alessandria [*R.A.M.*, ix, p. 158] were set up in the province of Treviso, Italy, to test the value of the data supplied by them in foretelling attacks of vine mildew (*Plasmopara viticola*). From the information so obtained [which is given in detail] the author concludes that while such stations may foretell the likelihood or otherwise of an outbreak with some certainty, they cannot predict the degree of severity that it will take, as this depends on numerous factors, especially atmospheric and soil humidity, which vary greatly over very small distances.

To establish such stations on a practical basis would, it is considered, at present be premature in the area concerned, but the experiments are to be continued.

DESSANTI (A.). **La infezione peronosporica e i mezzi di lotta.** [*Peronospora* infection and the means of control.]—*L'Istria Agric.*, N.S., x, 9, pp. 197–200, 1930.

After stating that in 1925 attacks of downy mildew of the vine (*Plasmopara viticola*) reached such intensity in Istria that the production of wine, which normally amounts to about 400,000 hl., was reduced to one quarter of this quantity, with a consequent loss to the growers of some 45 million lire, the author describes two forms of control adapted for dry and wet years, respectively.

In dry years a preliminary preventive application of Bordeaux mixture containing 0·5 kg. each of copper sulphate and (not fully slaked) lime per 100 l. water, should be given when the shoots are 10 cm. long, the whole vine being subjected to a fine cloud of spray. The second application is made a month later at double the strength, and the final one, also at this strength, after a further month. When the leaves have attained sufficient maturity to resist scorching, the fruit clusters should be dusted at intervals with 3 or 5 per cent. cupric sulphur.

In wet seasons the treatment is at first the same, the second and subsequent applications being made whenever the rain washes the protective covering off the leaves. After the first signs of infection appear the vines should be again sprayed, 60 gm. ammonium chloride and 90 gm. potassium permanganate being added to the mixture to increase its adhesiveness and toxicity. The applications should be continued until the infection is arrested. The liquid applications should be followed by frequent dusting with sulphur and copper sulphate at 3, or preferably 5 per cent., or 15 to 30 per cent. Caffaro powder with ordinary sulphur may be used instead.

De Villiers (F. J.). **Studies of Grapes in cold storage.**—*S. African Journ. Nat. Hist.*, vi, 4, pp. 315–329, 1929. [Abs. in *Chem. Abstracts*, xxiv, 14, p. 3573, 1930.]

The grapes used in these investigations were classified as greenish, ripe, and ripe + ; neither the first- nor the last-named kept as well as the fruit in a ripe condition. The inferior keeping quality of the over-ripe grapes is ascribed in part to the decrease in pedicel attachment, allowing the entrance of fungi. The apparently inherent keeping quality of certain varieties is associated with the impregnation of the cell walls with pectic substances or intercellular apposition of the latter, whereby a firmer structure and probably an increased reserve for metabolic activity are conferred. Grapes having a high acidity or high tannin content in the subepidermal layers are less liable to injury from fungi.

Salmon (E. S.) & Ware (W. M.). **Report from the Mycological Department.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxvii, pp. 87–96, 1930.

During 1929 a foot rot or scorch of the haulms of several acres of Union Jack garden peas in the vicinity of Wye, Kent, was caused by a species of *Ascochyta*, though adjoining Lincoln peas appeared to remain unaffected. Pansies (*Viola* sp.) in three separate localities showed a withering and dying-off apparently caused by a species of *Phytophthora*, as oospores measuring 22 to 28 μ in diameter were found in the main roots and bases of the stems, and when affected parts were placed in water, sporangia measuring 24 to 32 by 20 to 32 μ grew out. A fan-trained Lord Napier nectarine tree growing in a peach house showed symptoms closely agreeing with those of peach rosette, the higher branches bearing rosettes of short, clustered shoots and no fruit, while the lower branches were healthy but threw out shoots several feet long, the leaves on which were pale yellow-green.

'Split leaf' [*R.A.M.*, ix, p. 15] was again observed in the hop gardens, especially in those of the Fuggles variety, where it is often present together with nettlehead on one and the same plant. In the commercial varieties no serious damage was recorded, but the growth of certain seedling varieties in an experimental garden has been checked for two years. Tests in which healthy scions were grafted on the most diseased hill present indicated that 'split leaf' is not transmissible by this means.

Jahresbericht der Preussichen Landwirtschaftlichen Versuchs- und Forschungsanstalten in Landsberg (Warthe). Jahrgang 1929–30. [Annual Report of the Prussian Agricultural Experimental and Research Institutes at Landsberg a. d. Warthe. Year 1929–30.]—*Landw. Jahrb.*, lxxii, Supplement 1, pp. 1–140, 8 figs., 1 graph, 1930.

The phytopathological section of this report (pp. 62–91) contains, *inter alia*, the following items of interest [cf. *R.A.M.*, viii, p. 754]. The incidence of wheat bunt [*Tilletia caries* and *T. foetens*] was reduced from 40·6 per cent. to nil by dusting with preparation

1285 (Meyer, Mainz) and tutan, both at the rate of 100 gm. per 50 kg. of seed-grain. The best control of snow mould of rye (*Fusarium nivale*) [*Calonectria graminicola*] was given by 225 E (150 gm. per 50 kg. of seed-grain), which reduced the amount of infection from 52 to 2·5 per cent. Preparations 1394 and 1396 (Meyer, Mainz), applied at 200, 250, or 300 gm. per 50 kg. of seed-grain, effectively controlled stripe disease of barley [*Helminthosporium gramineum*], as did also 1405 (Meyer) applied by the short disinfection process [ibid., ix, p. 100] (100, 150, or 200 gm. in 1·5 l. per 50 kg.).

The nuclei of the leaf cells of potato plants affected by leaf roll are longer than those of healthy ones, while in the case of ordinary mosaic they are strikingly short and compressed. In 'Goldspende' mosaic of potato they are $1\frac{1}{2}$ times as long as those of the healthy tissues, and in aucuba mosaic $1\frac{3}{4}$ times as long.

The Rimpau's variety of sugar beet proved most resistant to root rot [*Phoma betae, Pythium de Baryanum*, and *Aphanomyces levis*] (1·1 per cent. infection, compared with 7·6 in Klein-Wanzlebener Z). Among the fodder varieties Criewener Gelbe was most resistant and Friedrichsw. Zuckerwalze most susceptible (1·7 and 7·2 per cent. infection, respectively).

In a series of tests in the combined control of *Fusicladium* [*Venturia inaequalis*] and apple moth [*Cydia pomonella*] the best results as regards scab reduction in the Ananas Reinette variety were given by three applications of Bordeaux mixture (2 per cent. at the first and 1 per cent. thereafter, with the admixture of Schweinfurt [Paris] green at the second and third), funguran, or fusibar. Nosprasit (three applications) gave fairly satisfactory results in one test of scab control on the Minister v. Hammerstein variety.

Bericht der Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau zu Geisenheim a. Rh. für das Rechnungsjahr 1929. [Report of the Viticultural, Pomicultural, and Horticultural College and Research Institute at Geisenheim a. Rh. for the financial year 1929.]—*Landw. Jahrb.*, lxxii, Supplement 1, pp. 405–498, 2 figs., 1930.

Among the items of phytopathological interest in this report (prepared on the usual lines) [*R.A.M.*, viii, p. 754], the following may be mentioned. In a series of tests of 1929 vine seedlings for resistance to *Plasmopara viticola* the American Riparia gave very satisfactory results, while the Seibel and Couderc selections were also deserving of notice in this respect [ibid., vii, p. 221].

Some reduction in the incidence of 'mauke' [*Bacterium tumefaciens*] on grafted vines was obtained by the excision of the cankers and the application to the infected stocks of various protectives of the carbolineum type [ibid., ix, p. 13]. None of these, however, proved wholly satisfactory, and it is considered doubtful whether more than 70 per cent. of the stocks in a given case could be saved by this method.

Glasshouse cauliflowers were severely damaged by *Sclerotinia sclerotiorum*.

A species of *Gloeosporium* (probably *G. stanhopeae* Allesch.)

characterized by small, spherical, orange-yellow to olive-green acervuli, arranged in concentric layers, was found on the whitish spots of wilted *Stanhopea* leaves.

MITRA (M.). **India: new diseases reported during the year.**—*Internat. Bull. of Plant Protect.*, iv, 7, pp. 103–104, 1930.

A species of *Helminthosporium* which is a common parasite of ginger (*Zingiber officinale*) was determined as a strain of *H. maydis* Nisikado & Miyake [*R.A.M.*, viii, p. 529].

Physoderma zeae-maydis was found to infect the leaves of *Euchlaena luxurians* [ibid., vii, p. 303].

A species of *Oidium* produces brown patches all over the under surface of *Piper betle* leaves in Upper Burma. The disease, which is at its height during the hot weather, may cause a loss of 20 to 40 per cent. of the crop.

Bananas were observed to be attacked for the first time in the Central Provinces by *Cercospora musarum* [ibid., viii, p. 731].

CUNNINGHAM (H. S.). **Report of the Plant Pathologist, 1929.**—*Rept. Dept. of Agric., Bermuda, for the year 1929*, pp. 26–31, 1930.

In addition to a number of other observations on the fungous diseases and insect pests of plants recorded in Bermuda during 1929, the following are of special interest. Two severe outbreaks of anthracnose (*Gloeosporium limetticolum*) [*R.A.M.*, vii, p. 162] on limes were reported. Excellent results were obtained in one case by spraying with Bordeaux mixture.

Sweet peas were heavily infected by anthracnose (*Glomerella rufomaculans*) [ibid., iii, p. 699], which caused a serious loss of flowers. The disease was well controlled by the application of Burgundy mixture. Stem rot (*Sclerotinia sclerotiorum*) was prevalent, and sometimes severe, on the same host. A species of *Rhizoctonia* also causes a root rot of sweet peas throughout the Colony. This fungus is amenable to partial control by the application of organic mercury compounds, but the practice of cultivating sweet peas year after year in diseased soil hinders the complete extermination both of the *Rhizoctonia* and *S. sclerotiorum*.

Tomatoes were severely injured by *S. sclerotiorum* [ibid., vii, p. 348], which always developed some distance above ground level (up to 3 ft.). Mild infection by *Phoma destructans* [? *P. destructiva*: ibid., viii, p. 140] was reported on tomato fruits.

STOREY (H. H.). **Plant pathology.**—*Second Ann. Rept. East African Agric. Res. Stat., Amani, 1929-30*, 1930.

The author's experiments to test the transmission of streak disease of maize and related grasses [*R.A.M.*, ix, p. 88] by insects other than *Cicadulina mbila* and by direct inoculation of maize with the streak virus gave negative results. While certain individuals of *C. mbila* inoculate the virus with great regularity, others appear unable to assimilate or transmit it.

Curly leaf of cassava [cf. ibid., ix, pp. 99, 260], an important factor in the native cultivation of this crop in East Africa, has been

found to belong to the virus group. Previous work on the transmission of infection through grafting has been confirmed. No insect vector has yet been detected.

A species of *Fusarium* causing heavy losses has been isolated from coffee bushes 'stumped' in the regeneration of the derelict plantations of the Usambaras.

Report of the Californian Agricultural Experiment Station from July 1, 1928, to June 30, 1929.—123 pp., 1 pl., 1930.

This report, on the same lines as in previous years [cf. *R.A.M.*, viii, p. 550], contains among others the following items of phytopathological interest.

The perfect stage of *Phomopsis californica* [ibid., vii, p. 714], the causal organism of decorticosis of lemons, was shown to be a *Diaporthe*, which was found embedded in the surface of dead pieces of bark.

A species of *Aspergillus* related to *A. parasiticus* [ibid., vii p. 385] was found attacking mealy bugs, and under suitable conditions of temperature and humidity was shown to be capable of killing the insects in a few days.

Co-operative experiments in the eradication of *Armillaria* [*mellea*] from orange roots by means of carbon bisulphide were successful. Although the roots are killed, the fungus appears to have been completely eliminated from the treated areas, with the result that replanting may safely be effected.

Investigations into diseases of almonds, which caused great losses in the Sacramento and San Joaquin valleys in 1928, showed that the prevailing diseases are due to *Sclerotinia cinerea*, *S. sclerotiorum*, and *Coryneum beijerinckii* [*Clasterosporium carpophilum*] [ibid., iv, p. 682].

Much attention was paid to the disease known as 'diamond canker' of French prune trees [*Prunus domestica*], and a fungus [? *Dematium pullulans*] regularly associated with the condition was isolated, together with one or more bacteria and a species of *Actinomyces* [ibid., ix, p. 323]; experiments are in progress to determine the pathogenicity of these organisms.

Study of green rot of apricots (*S. sclerotiorum*) has shed considerable light upon its epidemiology and control; the fungus was ascertained to sporulate much earlier and much more independently of climatic conditions than had been supposed.

The so-called 'buckskin' disease of cherry [ibid., viii, p. 550] which appears to belong to the virus group, is decidedly less prevalent in trees on Mahaleb root stocks than on Mazzard.

A crown rot of figs was caused by a species of *Phytophthora*.

Kopp (A.). **Les maladies des plantes à la Réunion.** [Plant diseases in Réunion.]—*Rev. de Bot. Appliquée*, x, 105, pp. 281–287, 1930.

In this paper, based on a report made by S. F. Ashby after a recent visit to Réunion, it is stated that mosaic of sugar-cane, reported as present in the island by Shepherd in 1924 [*R.A.M.*, iv, p. 313], was rediscovered in two localities on the popular Louzier

cane; the disease did not appear to be more prevalent than in 1924, probably owing to the extreme rarity of insect vectors, infected cuttings being the sole means of transmission. It is suggested that Louzier should be replaced by P. 131, M.P. 88, and Batavia.

Streak was present on R.P. 8 canes [cf. ibid., vii, p. 14; ix, p. 300] and was found on maize in one locality, where for several years it had been confused with mosaic.

In some localities entire plantations of vanilla were reported to have been destroyed by disease in a few weeks, the condition being the same irrespective of what variety of living tree the vanilla was trained on. It is considered possible that two distinct diseases may be present; in one, black lesions appeared on the stem, leaves, and pods, and caused them to rot. These spots contained a *Phytophthora* which fructified abundantly, producing sporangia closely resembling those of *P. palmivora* [cf. ibid., vii, p. 600]. This condition was most prevalent in the wettest parts of the plantations and appeared to be associated with excessive shade. Another disease of vanilla seemed to be due to a soil organism, as many planters reported a root and collar rot which also caused, immediately on their formation, a rot of the adventitious roots put out when the plants first became affected.

BERTHELOT (A.). **Sur un milieu artificiel convenant particulièrement à la culture du B. tumefaciens.** [On an artificial medium particularly suitable for the culture of *B. tumefaciens*.] —*Bull. Soc. Chim. Biol.*, xii, 1, pp. 109–111, 1930.

Solution A consists of KH_2PO_4 (2 gm.), $Na_2HPO_4 2H_2O$ (1·5 gm.), KNO_3 (0·25 gm.), K_2SO_4 (0·5 gm.), $(NH_4)_2HPO_4$ (1 gm.), crystallized $MgSO_4$ (0·25 gm.), saccharose (20 gm.), glucose (10 gm.), and asparagin (4 gm.) in 750 c.c. of distilled water. Solution B (to be added to A) is made up of 2 gm. citric acid and 1 gm. each of tartaric, malic, and glutamic acids in a small quantity of water, and neutralized with *Pelargonium* ash. Added together, the two solutions should be made up to 1 l., heated to 120° C. in the autoclave, cooled slowly, filtered, distributed in Pyrex tubes, and sterilized for 20 minutes at 115°. The P_H is generally 5 to 5·5, but in some cases it may be better to adjust it to 7·2 to 7·4 by the addition of sterile Na_2HPO_4. *Bacterium tumefaciens* makes abundant growth on this medium and exercises a strongly pathogenic action on *Pelargonium* [*R.A.M.*, viii, p. 116].

SCHEIBE (A.). **Studien zum Weizenbraunrost, Puccina triticina Erikss. III. Über die geograpische Verbreitung der einzelnen physiologischen Formen und Formenkreise in Deutschland und in seinen angrenzenden Gebieten.** [Studies on brown rust of Wheat, *Puccinia triticina* Erikss. III. On the geographical distribution of the individual physiological forms and form circles in Germany and the adjoining territories.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xviii, 1, pp. 55–82, 3 maps, 1930.

Continuing his studies on brown rust of wheat (*Puccinia triticina*) [*R.A.M.*, ix, p. 635], the writer found that the physio-

logical forms of the rust occurring in Germany may be divided into two main groups according to their behaviour on the Malakoff and Norka varieties, a west German and an east German. The former group (to which these two varieties are resistant) comprises forms XI, XIV, and XV, and to some extent XVI and XVIII, while the latter (to which they are susceptible) includes XIII, XVII, and XIX to XXIII. The river Elbe forms an approximate boundary between the two groups. The individual forms increase both in numbers and inherent intensity of attack towards the east, and it is in the east that new forms have been continually found, indicating that the 'specialization centre' of *P. triticina* lies in eastern Europe (Russia and the Balkans), while Germany is situated on its fringe. The possible significance, in this connexion, of the prevalence of the rust on its aecidial hosts in Russia, where Eremeyeva (*Morbi Plantarum*, xv, p. 145, 1926) found 14 species and varieties of *Thalictrum* were susceptible to infection with sporidia of *P. triticina* [cf. ibid., v, p. 25], is discussed in the light of recent work on the production of physiologic forms of *P. graminis* on the barberry [ibid., ix, p. 438].

The author's detailed investigations on rust biotypes have proved that several isolations of the rust may be described as all belonging to a single biotype on the ground of their reaction on the differential hosts, even when they originate in widely separated localities, but further analysis may indicate that they show constant differences and could be further subdivided. Thus form XIII, tested on a large number of wheats, was split into several races originating from different localities. It is, therefore, better that in comparative cases reference should be made to physiological form-circles, each comprising several strains, capable of producing an equal degree of infection on the standard wheat varieties used as differential hosts, but differing in their reaction on other varieties.

MARCHAL (E. M.). **Belgium: health of crops in 1929.**—*Internat. Bull. of Plant Protect.*, iv, 7, p. 97, 1930.

Wheat and spelt in Belgium have been found, for the first time, to be infected by the disease known in America as black chaff (*Bacterium translucens* var. *undulosum*) [*R.A.M.*, ix, p. 364].

KIENHOLZ (JESS R.) & HEALD (F. D.). **Cultures and strains of the stinking smut of Wheat.**—*Phytopath.*, xx, 6, pp. 495–512, 5 figs., 1 map, 1930.

Bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] is stated to be the most destructive disease of wheat in the Pacific Northwest [*R.A.M.*, ix, p. 446]. It not only causes direct losses by destroying the kernels but also contaminates the sound grains to such an extent that during the period from 1923 to 1928 an average of 36 per cent. of the cars arriving at the terminal shipping points were docked on account of bunt (*Rept. Pacific N.W. Wheat Improvement Conf.*, p. 11, 1928).

Prior to 1918 only *T. caries* was known to occur in Washington, but recent surveys have shown that *T. foetens* is now present in all

the main wheat-growing sections in the east of the State [ibid., viii, p. 774]. The present study was undertaken to find a suitable solid medium on which to grow the bunts and also to determine the possibility of separating the physiological strains by means of artificial cultures. The process of culturing the fungi [which is fully described] is divided naturally into two main phases, viz., germination and growth. Plain agar or soil-extract agar were found to be the most suitable media of those tested for the germination of the spores, while potato sucrose agar (4 per cent. sucrose) proved most effective in the differentiation of the physiological forms. The preliminary cultures yielded five distinct forms of each species of bunt, but subsequent transfers produced conflicting results and so far it has not proved practicable to separate the forms on constant cultural characters. Spore characters were not correlated with the differences manifested by these forms in culture. Inoculation experiments with pure cultures under field conditions gave negative results.

LEUKEL (R. W.). **Relation of dust fungicides to flow of small grains through drills and to drill injury.**—*U.S. Dept. of Agric. Circ.* 119, 9 pp., 1930.

The results of experiments [details of which are given] showed that none of the fungicidal dusts tested retarded the flow from the drills of cereal grains treated with them sufficiently to affect appreciably the yield per acre, at rates of delivery of over 6 pecks per acre. They also showed that dry dusted seed-grain is not likely to cause injury to the drill, even if left in the latter for several days, unless it is allowed to stand out in dew or rain [cf. *R.A.M.*, vi, p. 283].

LIMBOURN (E. J.). **Bunt resistance tests, 1929.**—*Journ. Dept. Agric. Western. Australia*, 2nd Ser., vii, 2 pp. 326–327, 1930.

In a further trial made in Western Australia of wheat varieties for resistance to bunt (*Tilletia levis*) [*T. foetens*], Genoa (P. 1511) [cf. *R.A.M.*, viii, p. 556] for the sixth year in succession remained entirely free from infection; however, as it matures very late, it is not recommended for commercial purposes.

MORWOOD (R. B.). **Flag smut in Wheat experiments, 1929.**—*Queensland Agric. Journ.*, xxxiii, 6, pp. 381–388, 1930.

Details are given of comparative tests made in 1929 at Allora and Roma, Queensland, of the relative resistance to flag smut (*Urocystis tritici*) [*R.A.M.*, viii, p. 770] of 31 named varieties of wheat and nine Departmental crosses, the results of which confirmed the high resistance of the Nabawa and Florence varieties reported in other Australian States: a similar or even greater degree of resistance was displayed by four promising Departmental crosses.

Seed treatment trials showed that dusting the seed-grain with copper carbonate, tillantin R, or U.T. 685 was ineffective against the smut in the case of heavily contaminated seed-grain. Good control was obtained by steeping the seed-grain in a 1·5 per cent. copper sulphate solution for three minutes or in a 1 in 400 formalin solution for ten minutes.

PRIDHAM (J. T.) & DWYER (R. E.). **Reaction of Wheat varieties to flag smut.**—*Agric. Gaz. New South Wales*, xli, 6, pp. 413–415, 1930.

In giving some details of continued tests of wheat varieties in New South Wales for resistance to flag smut [*Urocystis tritici*: see preceding abstract], the authors state that in addition to the varieties previously named the following were also found to be apparently immune from the smut, namely, Dan, Dindiloa, Ghurka, Tuela, and Zealand Blue. Among the most promising new highly resistant varieties [a list of which is given] are included Adage, Dundee, Dargum, Lawson, and Mac's White. Five as yet unnamed fixed crossbreds have so far proved to be mostly highly resistant. All the other varieties tested varied from moderately resistant to highly susceptible.

FRENZEL (H.). **Beitrag zur Spezialisierung des Haferkronenrostes, Puccinia coronifera f. sp. avenae Kleb.** [Contribution to the specialization of the crown rust of Oats, *Puccinia coronifera* f. sp. *avenae* Kleb.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xviii, 2, pp. 153–176, 1930.

Investigations during 1928–9 on the physiologic forms of the crown rust of oats (*Puccinia coronifera* f. sp. *avenae*) [*P. lolii*: *R.A.M.*, vii, p. 315] resulted in the isolation of 33 forms, differing in their infectivity on selected differential varieties of oats [tabular analyses of which are given], from 27 separate collections of the rust from different parts of Germany, Holland, Czecho-Slovakia, and Hungary. The differential varieties of oats were Ruakura C.I. 2025, Uruguay, Red Rustproof C.I. 1815 (*Avena sterilis*), Bri, Brünings Winter-Hafer, Green Mountain C.I. 1892, Odenwälder Strausshafer, *A. sterilis* var. *nigra* C.I. 840–49, and Mortgage. For measuring the degree of infection the scale from 0 to 4 devised by Stakman and Levine [ibid., ii, p. 158] was employed. The constancy of eight of these strains was demonstrated by a year's uninterrupted culture. No definite relation was found between the geographical distribution of the rust and the prevalence of particular forms, such as Scheibe found in *P. triticina* [ibid., viii, p. 366, and above, p. 767].

Observations on teleutospore formation in different strains of *P. lolii* indicated that the rapidity or facility of this process may be used as a diagnostic character in the case of certain forms (cf. Gassner, *Zeitschr. für Bot.*, vii, p. 65, 1915). Thus form 2 (from Weihenstephan, near Munich, and Böhmisch-Leipa) and 10 (from Weihenstephan) developed teleutospores in a short time, while 9 (from Brunswick, Kiel, and Baarn, Holland), 11 (from Munich), 17 (from Böhmisch-Leipa), and 20 (from Berlin-Dahlem and Quedlinburg) did not produce these spores at all.

Only a few of the 198 varieties of oats tested for their reaction to *P. lolii* [which is expressed in tabular form] showed any conspicuous degree of general resistance. Among the foreign varieties Green Mountain was highly resistant to forms 9, 11, and 17, while Ruakura was susceptible only to form 20 [cf. ibid., vii, p. 315];

Uruguay was very resistant to forms 2, 3 (from Dörflas, Thuringia), 9, 10, and 16 (from Brunswick), and some degree of resistance was further shown by Bri, Mortgage, and Mortgage Lifter. Resistance was chiefly shown among the German varieties by the Brünings, Griesings, and Schwarz winter sorts, and by Odenwälder Strauss. Among the *Avena* species (other than *A. sativa*) tested, one strain of *A. abyssinica* was highly resistant to forms 9 and 16, and one of *A. brevis* to form 20. The one strain of *A. byzantina* and the three of *A. fatua* tested were susceptible to all the author's forms of *P. lolii*. Red Rustproof C.I. 1815 (*A. sterilis*) was highly resistant to forms 2, 3, and 14 (from Baarn and Dahlem), and White Russia (*A. strigosa*) showed a considerable degree of resistance to forms 3 and 20.

Of the 19 grasses inoculated with 14 strains of *P. lolii*, only *Dactylis glomerata* and *Phleum pratense* developed necrotic symptoms with pustule formation. Chlorotic spots were induced in *Triticum* [*Agropyron*] *repens* by all the forms except 17, with necrosis in the case of form 10.

MURPHY (H. C.) & STANTON (T. R.). **Oat varieties highly resistant to crown rust.**—*Journ. Amer. Soc. Agron.*, xxii, 6, pp. 573–574, 1930.

The Victoria (C.I. No. 2401) variety of oats (of Argentine origin) is stated to have shown a high degree of resistance to crown rust (*Puccinia coronata avenae*) [*P. lolii*] under field conditions in Iowa and Kansas during 1929. Eight physiological forms of the rust [*R.A.M.*, ix, p. 371] were found to be comprised in the 156 collections made in various parts of the United States in 1929, and Victoria showed an 'apparently immune', 'completely resistant', or 'highly resistant' type of reaction to inoculation with each of these. A similar (probably identical) strain, Avena Victoria (C.I. No. 2764), also proved resistant to all these forms, while *A. strigosa* var. *glabrescens* from New South Wales (C.I. No. 2630) was resistant to all except one.

O'BRIEN (D. G.) & PRENTICE (E. G.). **Leaf stripe or yellow leaf of Oats.**—*Scottish Journ. of Agric.*, xiii, 3, pp. 272–284, 4 pl., 5 figs., 1930.

Leaf stripe of oats (*Helminthosporium avenae sativae*) [*H. avenae*: *R.A.M.*, viii, p. 714] is stated to be by far the most destructive disease of this crop in Scotland (especially the south-west), causing greater losses than all others combined and necessitating a heavy rate of seeding—8 to 10 bushels per acre—in order to obtain reasonably good stands. The average incidence of infection in the fields of the south-western counties was found to be 25 per cent.

The primary phase of the disease occurs in the seedling almost as soon as germination begins, while the secondary stage is observed at or about the time of flowering. Many of the plants infected during the initial stages of growth fail to appear above ground, while others reach the surface but succumb before the first seedling leaf emerges from the coleoptile. The first symptom

observed on infected plants which succeed in growing is the appearance of small, whitish, rounded dots, later turning reddish-brown with a light brown or yellowish-white centre. From the affected spot the discoloration spreads up and down the leaf, so that eventually a distinct brownish or yellow stripe runs the entire length of the blade. Finally the affected leaves turn brown or reddish and shrivel. The second and third seedling leaves contract infection in their turn and share the fate of the first. On the death of these leaves the fungus produces great numbers of pale straw-coloured to light brown, two- to eight-celled conidia which are very loosely attached to the hyphae and thus readily dispersed by wind or insects to the uppermost leaves, from which the growing grain in the spikelet is infected. Under adverse conditions diseased plants may die without producing a fourth leaf.

The conidia produced on the upper leaves germinate on the open flowers of neighbouring plants to which they are carried, forming a mycelium that invades the surface layers of the grain ; the latter, if used for seed, acts as a source of infection to the succeeding crop. Generally a number of spikelets on diseased plants are barren ; they are white and were formerly termed 'blind' or 'blasted'.

The old straw-producing varieties of oats, e. g., Potato, Sandy, and Tam Finlay, appear to be much less susceptible to the attacks of *H. avenae* than the newer, chiefly grain-yielding ones, such as Marvellous, Victory, Ascot, Record, and Supreme.

Experiments showed that early-sown oats developed a much higher incidence of primary leaf stripe than those sown later (40 per cent. in March, compared with less than 5 late in May). Evidently, therefore, a relatively high soil temperature enables the shoots to emerge rapidly from the seed and thus escape infection.

Tests [which are described] of the control of the disease by seed treatment showed that germisan (0·5 and 1 per cent.), uspulun (0·25 and 0·5 per cent.), tillantin dust, and ceresan (formerly tillantin R) dust (2 oz. per bushel) [ibid., ix, p. 299] are eminently suitable for this purpose. The last-named preparation was used in field tests on a larger scale with very satisfactory results, a saving of 3 bushels of home-grown seed per acre being effected by the treatment in the case of the Marvellous and Victory varieties, the corresponding figure for east-country seed being 1 to 2 bushels. The cost of treatment with ceresan is twopence per bushel, or eightpence per acre, assuming that 4 bushels are required to cover this area. The cost of the labour involved is only about one farthing per bushel and can therefore be neglected in the estimate. Actual figures of the yields from treated and untreated fields are not yet available, but the estimated increase may be placed at a minimum of 10 per cent. or seven-and-sixpence per acre, and the net profit at fifteen shillings per acre, half of which is due to saving on the seed and the other half to the augmented yield. In 1928 the area under oats in Ayrshire was about 34,500 acres, and in the district served by the West of Scotland Agricultural College 228,000, so that the net profits from treatment in these two regions would be £26,000 and £171,000, respectively.

Raleigh (W. P.). **Infection studies of Diplodia zeae (Schw.) Lev. and control of seedling blights of Corn.**—*Iowa Agric. Exper. Stat. Res. Bull.* 124, 121 pp., 11 figs., 1930.

A full account is given of investigations conducted at Iowa into infection of the ears and kernels of maize by *Diplodia zeae* [cf. *R.A.M.*, ix, p. 521] and its control by seed disinfection, with special reference to the factors influencing the progress of the fungus from the seed to the seedling and to laboratory methods of testing the efficacy of the fungicides used. The results obtained [which are tabulated and discussed in detail] may be summarized as follows.

The most important forms of maize disease produced by *D. zeae* are seedling blight and ear rot. Artificial inoculation of the ears was successful in all stages of their development, but most readily in the 'milk' stage. Infection of seedlings from the kernels usually took place in the natural wounds at the points of production of the secondary rootlets near the attachment of the mesocotyl to the scutellum.

Field tests in 1925 and 1927 showed that seed infected by *D. zeae* produced, respectively, 4·5 and 1·3 times as many weak plants as did comparatively clean seed. Plants weakened early in the season by *D. zeae* or *Basisporium gallarum* [*Nigrospora sphaerica*: loc. cit.] often produced normal ears, provided there was no competition with strong plants.

When the seed was infected with *D. zeae* fewer plants developed at 15° to 19° C. than at 20° to 24°; owing to the many seedlings killed before reaching the surface of the soil there was also less visible seedling blight at the lower than at the higher temperatures.

In 1926, seed infected with *D. zeae* and treated with various [named] disinfectants gave increased yields over untreated seed of 6·8 to 13·9 bushels per acre, the highest yield from the treated infected seed being about only 6 bushels less than that obtained from similarly treated but nearly disease-free seed. Immersion for 1½ hrs. in 0·5 per cent. uspulun and dusting with Dupont 12 bel dust were the best treatments, but others were little inferior. In 1927, seed treatments with Bayer, merko, and semesan jr. dusts increased the yield of *Diplodia*-infected seed by 21·3 to 30·2 per cent., and that of seed infected with *N. sphaerica* by 15·5 to 19·6 per cent., as compared with untreated seed.

The benefits derived from the seed treatment of maize vary considerably with the amount of infection present, the climatic and soil conditions, and, apparently, with the strain of maize used.

Elliott (Charlotte). **Bacterial streak disease of Sorghums.**—*Journ. Agric. Res.*, xl, 11, pp. 963–976, 2 pl. (1 col.), 4 figs., 1930.

Sorghum (*Holcus* [*Andropogon*] *sorghum*) and *H.* [*A.*] *halepensis* are subject in Texas, Oklahoma, Kansas, and Montana to a bacterial streak disease, characterized by water-soaked lesions developing later into elongated oval spots with tan centres and narrow red margins. The abundant bacterial exudate dries into

thin white to cream-coloured scales. The disease spreads from younger to older leaves, but apparently the injury to the plants is not sufficiently severe to necessitate control measures.

A full description is given of the morphological, cultural, and physiological characters of the yellow, polar-flagellate organism isolated from diseased plants, together with a technical diagnosis. The organism, which is named *Bacterium holcicola* n. sp., measures on an average 1·58 by 0·75 μ; it is Gram-negative, non-acid-fast, liquefies gelatine slowly, and grows best at 28° to 30° C., the minimum and maximum temperatures for development being 4° and 36° to 37°, respectively, and the optimum hydrogen-ion concentration of beef infusion peptone broth P_H 7 to 7·5 (minimum and maximum 5·5 and 9, respectively). A table is given showing the comparative morphological, cultural, and physiological characters of *Bact. holcicola*, *Bact. andropogoni* [*R.A.M.*, viii, p. 440], *Bact. holci* [ibid., v, p. 547], and *Pseudomonas alboprecipitans* [ibid., ii, p. 447].

Experimental lesions were produced on Dwarf White Milo sorghum by spraying with cultures of the organism isolated from young lesions on the same variety. Numerous typical infections also resulted from the inoculation after dark of Dwarf White Milo with *Bact. holcicola* from *A. halepensis*. The exact mode of dissemination has not been ascertained, but the available evidence points to the transmission of infection through the seed or soil.

A varietal susceptibility test indicated that the heaviest infection occurs on Pink Kafir × Milo × Feterita, Pink Kafir × Milo, Dwarf Yellow Milo × Dwarf Hegari, Wonder Kafir, Farr's Hegari × Milo, Farr's European Milo, Farr's Dwarf Hegari, and Pink Kafir × Dwarf Milo, while White Kafir (C.I. 342) was practically immune and White Kafir (C.I. 314) and Leoti Red Sorgo highly resistant.

HIURA (M.). **A simple method for the germination of oospores of Sclerospora graminicola.**—*Science*, N.S., lxxii, 1856, p. 95, 1930.

The oospores of *Sclerospora graminicola* [*R.A.M.*, ix, p. 105] may be induced to germinate by placing a small piece of moist filter paper bearing minute quantities of oospore powder on the surface of a layer of moistened cotton in the bottom of a Petri dish (care being taken that the contact between the paper and the cotton is only partial) and a second similar layer in the lid of the dish, the space between the two being about half the height of the dish. Small blocks of 2 per cent. agar may be substituted for the filter paper. The time required for germination varies considerably at different temperatures, being 22 to 40 hours at 35° C., 24 to 45 at 30°, 30 to 48 at 25°, 42 to 60 at 20°, 3 to 4½ days at 15°, and 9 to 10 days at 10°.

SATTAR (A.). **Sorosporium paspali McAlp. on Paspalum scrobiculatum L., Kodra smut.**—*Imper. Inst. of Agric. Res., Pusa, Bull.* 201, 16 pp., 2 pl., 3 graphs, 1930.

This is a full account of *Sorosporium paspali* on the millet

Paspalum scrobiculatum in Bihar, India, a preliminary report on which has already been noticed [*R.A.M.*, vii, p. 304]. In addition to the information already given, it is stated that experiments showed that the smut is chiefly seed-borne and that infection by spores from the previous year's crop persisting in the soil is insignificant, especially in seasons when rain occurs between April and June, prior to sowing the millet; in years, however, in which rain does not occur during this period, the crop should not be sown in fields that bore smutted millet in the preceding season. Infection of the seedlings was found to occur by penetration of the germ-tube through the cell walls, the resulting mycelium then developing both inter- and intracellularly in the host tissues. The maximum temperature for germination of the smut spores is between 34·5° and 37·5° C., the minimum below 19°, and the optimum about 30°.

Good control of the disease was obtained by steeping infected seed-grain for half an hour in a 1·5 per cent. copper sulphate solution or by dusting it with powdered copper carbonate at the rate of 1 oz. to 10 lb. grain [ibid., viii, p. 225]. Keeping the seed-grain treated by either method for two months did not impair its germinability.

[Young (W. J.) & Read (F. M.).] **The preservation of Citrus fruit. Progress Report of the Citrus Preservation Committee.**—*Journ. Australia Council Sci. & Indus. Res.*, iii, 2, pp. 69–76, 1930.

Washington Navel oranges picked near the Murray river were sent unwrapped in boxes to Melbourne, one-half having been handled throughout with gloves and the rest in the ordinary way. Both batches were then divided into eight lots, (1) untreated, (2) coated with paraffin without preliminary washing, (3) washed in water only, (4) washed in 5 per cent. sodium bicarbonate, (5) washed in 5 per cent. borax, three further lots receiving the three last-named treatments followed by a paraffin spray; all the lots were then stored at 38° F. The oranges handled with gloves kept better than the rest, but after 76 days' storage all the fruit showed much wastage, due mainly to *Penicillium italicum* and *P. digitatum* [*R.A.M.*, vi, p. 480].

Valencia oranges (picked with clippers and handled with gloves) were packed loosely into boxes and sent to Melbourne without sizing or grading in the local shed. Washing in sodium bisulphite at concentrations of 1, 2·5, and 5 per cent., respectively, was substituted for washing in water, but otherwise the treatments were those given in the first experiment. All the fruit kept remarkably well up to 124 days; thenceforward up to 155 days marked collapse set in, which was, however, reduced by the treatments with borax and paraffin and with bicarbonate and paraffin from 70 per cent. to 33 and 37 per cent., respectively. Most of the wastage was due to a stem end rot which often extended down the central pith, and first became noticeable after one to two months' storage as a brown discoloration round the button, generally circular and up to ½ in. in diameter. After three months many of these areas showed the presence of *Alternaria citri*; a *Penicillium* resembling *P.*

digitatum and a *Fusarium* were also present, the former producing a green, and the latter a pink, central rot. *P. italicum* and *P. digitatum* were very little in evidence except in the fruit treated with the bisulphite.

In a third experiment, made to test washing treatments, packing methods, and storage at various temperatures, Washington Navel oranges picked with clippers and handled with gloves were packed loosely into cases in the orchard and sent to Melbourne direct, others first passing through the packing shed. The fruit sent direct to Melbourne was treated as in the previous tests, except that salicylic acid was substituted for the sodium bisulphite, counts being made after six, and again after eleven and a half, weeks' storage. Most of the wastage was due to *P. italicum*. All the treated fruit, except that treated with salicylic acid and paraffin, showed much less mould than did the untreated, but there was little difference in the effects of the various treatments.

In the packing test the results obtained after eleven and a half weeks' storage [which are tabulated] showed that even the most careful packing before storage damaged the fruit, though oranges stored loose in boxes developed very little mould. Treatment with borax and paraffin was very beneficial, two lots so treated showing, respectively, only 3 and 4 per cent. moulds as compared with 45 and 25 per cent. in the corresponding untreated lots.

When oranges, both untreated and after treatment with borax and paraffin, were stored at temperatures ranging from 32° to 45°, after eleven and a half weeks at 32° the fruit had become unsaleable, while that kept for the same period at 38° showed marked collapse of the skin; the fruit kept at the highest temperature was, however, in excellent condition, and after fifteen weeks, whether treated or untreated, showed only 5 or 6 per cent. total wastage from all causes.

It is concluded that to store Navel oranges in perfect condition for two to three months and Valencias for even longer the fruit requires only more careful handling than is usual in Australia, together with protection from ordinary sources of mould infection. The results derived from the treatment with borax or bicarbonate of soda and subsequent spraying with paraffin are also considered to be encouraging.

PUTTERILL (V. A.). **The prevention of mould wastage in Oranges.** —*S. Africa Dept. of Agric. Bull.* 64, 20 pp., 1930.

Details are given of experiments in 1925, which were made both under laboratory conditions at Pretoria and under commercial shipment conditions, to test the efficacy of various treatments of oranges before loading, including the sodium borate or borax dip recommended by Fulton and Bowman [*R.A.M.*, iv, p. 164 and preceding abstract], against the development of moulds (*Penicillium digitatum*, *P. italicum*, and *Pythiacystis* [*Phytophthora*] *citrophthora*). The best results were obtained with the borax treatment, which was shown, however, to be effective only as an adjunct to careful handling of the fruit in harvesting and during transit; it may also be used as a precautionary measure in cases where the

oranges have to be brushed for scale or are likely to receive rougher handling during transit than usual, or when they belong to varieties known to be very susceptible to the moulds. There was evidence that infection and wastage of the fruit are reduced by using wrappers which retain the decayed fruits and prevent the wetting of sound oranges. Observations on the parasitism of *P. digitatum* and *P. italicum* led the author to consider that the former may directly infect sound oranges under certain conditions, just as the latter is already known to do [ibid., iv, p. 539].

Reichert (I.) & Hellinger (Esther). **Control of Diplodia stem-end rot of Citrus.**—Reprinted from *Hadar*, iii, 6, 12 pp., 1 fig., 1930.

An account is given of the characteristic symptoms of the *Diplodia* stem-end rot of citrus (*D. natalensis*) as it occurs in Palestine [*R.A.M.*, viii, pp. 235, 236]. The disease causes heavy and increasing losses to the orange industry. A random examination by the Empire Marketing Board at Manchester in November, 1928, of imported Palestine oranges from 16 different orchards showed an average incidence of stem-end rot of 13 per cent. In December, 1928, 2·7 per cent. infection was found in an orchard near Jaffa, the corresponding amount at the same period in 1929 being 14·5 per cent. An examination of rotted fruit, made by the senior author and an officer of the Empire Marketing Board at Liverpool in February, 1930, showed that a quarter of the decay was due to *Diplodia*. At a conservative estimate, therefore, the loss sustained by the orange industry during the current year may be placed at 200,000 boxes (twice as much as the previous season), of the value of £25,000.

A baffling feature of stem-end rot of citrus in Palestine is its sudden development. The disease is at its height in fruits picked early in the season (November and December), declines during January and February, and again reaches a peak, of lesser height than the first, during March and April. This may be due to the favourable temperature conditions for the germination of the fungus and infestation of the fruit prevailing during the above-mentioned periods (15° to 20° C. mean temperature for November and December and 15° to 18° for March and April). During January and February the mean temperature drops to 13° to 14°, a point near the minimum for the development of *D. natalensis* (12° to 13°).

Three methods have been tested for the control of stem-end rot, namely, pruning the dead wood from the trees in the orchards, spraying the trees, and removing the buttons from the fruit. The results [which are tabulated] of experiments in pruning and spraying the trees with Bordeaux mixture indicated that the former process is extremely effective, reducing the percentage of infection from 6·2 to 0·2 in fruit coloured by ethylene gas and from 2·4 to 0·5 in uncoloured. No additional benefit appeared to be derived from spraying. Debuttoning the fruit by colouring with ethylene gas at 29·5°, which causes the buttons to fall, reduced the amount of stem-end rot from 2·4 per cent. to none, without causing any

increase of moulds (*Penicillium italicum* and *P. digitatum*). Colouring the fruit without removing the buttons favoured the development of *D. natalensis*.

BALLY (W.). **De zwarte wortelschimmels van Koffie.** [The black root fungi of Coffee.]—*Arch. voor Koffiecult. Nederl.-Indië*, iv, 1, pp. 1–16, 3 pl., 6 figs., 1930. [English summary.]

Coffee (*Coffea robusta*) trees on a south Java estate interplanted with *Hevea* rubber and lamtoro (*Leucaena glauca*) were observed in February, 1929, to be infected by a species of *Rosellinia* which is identified as *R. bunodes* [the morphological characters of which are fully described: *R.A.M.*, ix, p. 129].

In the early stages of infection the stem base, the root-collar, the top of the tap-root, and some of the lateral roots immediately below soil level were attacked, while the lower part of the tap-root and the lateral roots in the deeper soil layers were quite healthy. Infection, therefore, probably takes place through the root-collar. The stem bases of most of the affected coffee and *L. glauca* were girdled by the fungus and presented a characteristic 'gnawed' appearance quite distinct from that produced by *Fomes lamaoensis*, the only other important cause of injury to coffee in the district under observation [ibid., vii, p. 20].

As in the case of tea [ibid., ix, p. 614], coffee is attacked by *R. bunodes* in new clearings and in soils having a low exchange acidity. Experiments are in progress to determine the efficacy of sulphur in correcting this condition and thereby arresting the development of the disease.

[This paper is also published as *Meded. Proefstat. Malang*, 72, 16 pp., 3 pl., 6 figs., 1930.]

MULLER (H. R. A.). **Verband tusschen den zuurgraad van den grond en het optreden van topsterfte.** [Relation between the degree of soil acidity and the occurrence of top die-back.] —*Arch. voor Koffiecult. Nederl.-Indië*, iv, 1, pp. 29–31, 1930. [English summary.]

Analyses [the results of which are tabulated] of the Daikuhara and hydrolytic acidities and the hydrogen-ion concentration of samples of soil taken from round the roots of healthy and top-diseased coffee (*Coffea robusta*) trees [*R.A.M.*, ix, p. 91] in four plantations of south Sumatra revealed no differences. It is concluded, therefore, that no relation exists between these two factors and the occurrence of top disease.

SZYMANEK (J.). **Notes phytopathologiques sur les Cotonniers au Soudan Français.** [Phytopathological notes on Cotton plants in the French Sudan.]—*Rev. de Bot. Appliquée*, x, 105, pp. 294–299, 2 figs., 1930.

In the French Sudan, anthracnose [*Glomerella gossypii*] of cotton leaves, stems, and bolls becomes common about midway through the vegetative period. Angular leaf spot [*Bacterium malvacearum*] also occurs but is rather less prevalent. In the

vicinity of Ségou Asiatic cottons are much more resistant to these diseases than are American varieties, but in the less arid region to the south of the river Bari the Asiatic variety Karangavi was severely affected. Wilt (*Fusarium vasinfectum*) caused heavy losses. The attacks are intermittent and their intensity varies with the locality. Near Ségou the disease becomes most intense when the rains are most frequent and abundant, i. e., when the soil remains damp and the temperature favours the development of the fungus.

Massey (R. E.). **Studies on blackarm disease of Cotton.**—*Empire Cotton Growing Review*, vii, 3, pp. 185–195, 2 figs., 1930.

In continuation of his studies on the blackarm disease of cotton (*Bacterium malvacearum*) in the Sudan [*R.A.M.*, viii, p. 568], the author briefly describes a field experiment in 1929 in the Gezira, which showed that the use of heat-sterilized cotton seed did not protect the crop from the development of the disease, a result which suggested some other possible source of infection. Subsequently five-month-old cotton plant débris was found in the field still bearing the parasite in an active condition, and it was established that within the old, dried-up bolls *Bact. malvacearum* can withstand a temperature of 80° for 72 hours, being thus much more resistant to heat in a dry resting stage than in the actively growing condition. Exposure of infected débris to sunlight for two months left the vitality of the organism unimpaired. Examination of soil samples indicated that the survival of the parasite in soil for any length of time is doubtful in the absence of plant débris ; it was shown, however, that it can survive in river water for several weeks. Evidence was also obtained of the existence of a filter-passing stage of the organism, but its occurrence in nature has not yet been demonstrated.

A study of the relationship between boll and seed infection led to the main conclusions that clean bolls produce healthy seed, and that severe infection of the boll is necessary for the interior of the seed to become infected.

The general conclusion arrived at from the investigation is that, wherever dry fallow is practised, *Bact. malvacearum* is capable of persisting in the field between seasons on old infected cotton plant tissues, this to a great extent explaining the reappearance of the disease in areas in which clean seed is sown.

Gibson (A. G.). **The mycoses of the spleen.**—169 pp., 10 pl. (3 col.), 1 fig., London, Kegan Paul, Trench, Trubner & Co., Ltd., 1930.

The author presents some general considerations on the subject of splenomegaly (associated by some workers with *Aspergillus nantae*) [*R.A.M.*, vii, p. 782 ; ix, p. 314], and gives full clinical details of a number of cases which have come under his notice. The results of an anatomical and histological examination of diseased spleens, and of cultures obtained from this material, are fully described. Out of six positive cultures in human cases four strains of a *Nocardia* [*Actinomyces*]-like organism, which is named *N. splenica*, have been isolated and studied ; the cases in question

were two of splenic anaemia, one of acholuric jaundice, and one of Banti's disease. Two of the strains were found to be pathogenic to monkeys, producing a chronic illness in 17 animals; in 6 of these positive cultures of the organism were obtained from the blood or from the tissues after death. In a concluding chapter on the development of the mycotic hypothesis and the contribution of French workers, the writer sets forth the considerations which incline him to support this view of the etiology of splenomegaly.

A six-page bibliography is appended.

CASTELLANI (A.). **Fungal diseases of the tonsils (tonsillomycoses.)**—*Journ. Trop. Med. & Hygiene*, xxxiii, 12, pp. 165–180, 31 figs., 1930.

After giving a detailed review of the history, physiology, morphology, pathogenicity, and other characters of the various fungi associated with tonsillomycoses, the author states that follicular tonsillomycosis is generally attributable to infection by species of *Monilia* [*Candida*], sometimes to *Cryptococcus* and *Saccharomyces* spp., occasionally to *Debaryomyces*, *Willia*, and *Endomyces* spp., and very rarely to *Trichosporum*, *Hemispora*, and *Actinomyces*.

Diphtheria-like tonsillomycosis, like the foregoing, is usually due to species of *Monilia* [*Candida*], while more rarely species of *Cryptococcus*, *Debaryomyces*, *Willia*, and *Saccharomyces* are involved.

Tonsillomycosis fusca is due to species of *Hemispora* (most of which have been shown by Ota to belong to the genus *Trichosporum*) [ibid., ix, p. 35], and in some cases to *Oidium* [*Oospora*].

Notes are given on the symptoms, diagnosis, prognosis, and treatment of all these conditions.

MACLEOD (J. M. H.). **Some skin affections due to yeast-like fungi.**—*Brit. Med. Journ., 1930*, 3624, pp. 1119-1123, 1930.

The writer reviews the present status of information concerning the skin affections due to (1) various species of *Monilia* [*Candida*], e. g., *C. albicans* and *C. pinoyi* [*R.A.M.*, viii, p. 780; ix, pp. 310, 311, *et passim*]; (2) *Microsporon* [*Malassezia*] *furfur* [see next abstract]; (3) *Blastomyces* [ibid., ix, p. 240]; and (4) *Coccidioides immitis* [ibid., ix, p. 718].

BENEDEK (T.). **Cryptococcus malassezi (Pityrosporon malassezi, Sabouraud 1895.)**—*Zentralbl. für Bakt.*, Ab. 1 (Orig.), cxvi, 4–5, pp. 317–332, 1 pl., 1 fig., 1930.

This is a comprehensive study of the morphology, physiology, and taxonomy of *Cryptococcus malassezi* (Sabouraud, 1895) emend. Benedek, 1929 (*Malassezia furfur*) [*R.A.M.*, iv, p. 607; ix, p. 382]. The only reliable method of culturing this fungus is stated to be by sowing the squamae in hanging drops in acid media (P_H 4·7 to 4·9); mass sowings on solid or liquid media were found to be useless. The fungus is a unicellular organism, reproducing solely by budding and forming neither mycelium nor spores. The optimum temperature for growth lies between 18° and 27° C. *M. furfur* is highly inactive from a biological standpoint, forming no toxins

and being entirely non-pathogenic to animals. The author concludes, in opposition to various other workers, that the fungus is merely one of the many pure saprophytes inhabiting the detritus of the stratum corneum.

Langeron (M.) & Milochevitch (S.). **Morphologie des dermatophytes sur milieux naturels et milieux à base de polysaccharides. (Note préliminaire.)** [The morphology of dermatophytes on natural media and on media containing polysaccharides. (Preliminary note).]—*Ann. de Parasitol. Humaine et Comp.*, viii, 3–4, pp. 422–436, 1930.

In this preliminary note the authors give details of the morphology of four species of dermatophytes (three of *Trichophyton* and one of *Achorion*) cultured by them on natural vegetable substrata (cereal grains, straw, &c.), horse dung, and on media prepared from polysaccharides (wheat flour, starch, and dextrin). The morphological characters of the organisms on these media support the conception of homogeneity of the group of dermatophytes advanced by Sabouraud on biological grounds. They also showed a considerable degree of mycelial polymorphism on the various media and in particular a tendency to the development of mycelial structures (arched hyphae, terminal spirals ('vrilles'), pectinate hyphae, and the like) resembling those described in the genus *Ctenomyces* [cf. *R.A.M.*, v, p. 553].

Langeron (M.) & Talice (R. V.). **Nouveau type de lésion pilaire expérimentale produite par la culture purement pléomorphique du Sabouraudites felineus.** [New type of experimental lesion of the hair caused by a purely pleomorphic culture of *Sabouraudites felineus*.]—*Ann. de Parasitol. Humaine et Comp.*, viii, 3–4, pp. 419–421, 1930.

The authors state that two pleomorphic strains of *Sabouraudites felineus* (*Microsporon felineum*) [*R.A.M.*, viii, p. 576] inoculated on guinea-pigs produced a lesion of the hairs of an almost exclusively endothrix type, corresponding to the first stage of invasion of the hair by non-pleomorphic strains of the fungus. In the lesions the organism remained purely mycelial, with no trace of even rudimentary sporulation. Reisolations from such lesions again yielded pleomorphic cultures, which on further inoculation reproduced the same type of lesion.

Baudet (E. A. R. F.). **Sur une teigne trichophytique du dromadaire produite par une espèce nouvelle de Grubyella, G. langeroni n. sp.** [On a trichophytotic ringworm of the dromedary caused by a new species of *Grubyella, G. langeroni* n. sp.]—*Ann. de Parasitol. Humaine et Comp.*, viii, 3–4, pp. 411–418, 2 pl., 6 figs., 1930.

Isolations from squamae from ringworm lesions on two young dromedaries, recently arrived from Algeria at the Zoological Garden of the Hague, Holland, yielded a fungus which formed very slowly growing, white, raised, conical colonies, sometimes furrowed on the surface and covered with a short white down. The organism is characterized by a sparsely septate mycelium,

with hyphae from 4 to 4·5 μ in diameter, bearing laterally and terminally more or less rudimentary aleuria on irregular claviform formations, and also claviform filaments ('chandeliers faviques'), and by a great abundance of arthrospores (from 6 to 10 μ in diameter) disposed in chains. Later, large intercalary or terminal chlamydospores formed in the cultures.

The appearance of the colonies indicated that the fungus belongs to the downy group of *Trichophyton* ectothrix, but morphologically it differs from the four species so far known of this group, namely, *T. rosaceum*, *T. vinosum*, *T. equinum*, and *T. caninum*, and stands closer to *Grubyella camerounensis* [*R.A.M.*, v, p. 364], from which it also differs, however, in its greater aerial growth and non-septate arthrospores. The organism is therefore considered to be a new species which, according to Ota's and Langeron's new classification, is placed in the genus *Grubyella* and is named *G. langeroni*.

URUEÑA (J. G.). **Ringworm of the soles in Mexico; clinical study.**—*Arch. of Dermatol.*, xxi, 6, pp. 909–915, 4 figs., 1930.

After a brief review of the various types of dermatomycosis occurring in Mexico, the writer describes a case of ringworm of the soles of the feet in a young man. The fungus isolated from the affected region was characterized by pure white hyphae, chains or heads of short and crowded aleuria, chlamydospores, and terminal spindles (acrospores) with three to five irregularly placed septa: it is identified as a variety (of the *gypseum* or *niveum* type) of *Trichophyton asteroides* [*R.A.M.*, ix, p. 383].

WRIGHT (R. E.). **Hypopyon ulcer of the cornea due to Glenospora graphii.**—*Brit. Journ. of Ophthalmology*, xiii, 10, pp. 496–498, 1929.

From a hypopyon ulcer of the cornea in a 38-year-old Hindu woman the author isolated a fungus characterized by having both pale and dark hyphae bearing at their apices aleuriospores generally measuring 6 by 4 μ in diameter (rarely 11 by 5 μ). The organism was identified by Prof. H. W. Acton as *Glenospora graphii*. Infection is believed to have been contracted through the penetration of the cornea by a rice or other stalk while the woman was working in the fields.

PENA (P.). **A propos d'un cas de mycétome à grains blancs observé à Assomption (Paraguay) et produit par le Scedosporium apiospermum.** [Concerning a case of mycetoma with white grains observed at Assumption (Paraguay) and produced by *Scedosporium apiospermum*.]—*Comptes rendus Soc. de Biol.*, civ, 21, pp. 689–690, 1930.

The examination of cultures of a fungus, isolated by Delamare and Gatti from a case of mycetoma with white grains and designated by them as *Indiella americana*, has convinced the writer that the organism in question is identical with *Scedosporium apiospermum* [*R.A.M.*, ix, p. 718]. The conidia are unicellular, ovoid or spherical, hyaline or pale yellow, measuring 6 to 9 by 4 to 5 μ, and are borne terminally or laterally on septate, branched hyphae, 3 to 4 μ in diameter. Intercalary and terminal chlamydospores were also detected.

Kletschetoff (A. N.). Система борьбы с льноутомлением почвы. [Methods for the control of Flax sickness of the soil.]—*Вестник Льняного и Пенькового Дела.* [*Flax and Hemp Indus. News*], Moscow, vii, 6, pp. 488–500, 1930.

After giving a brief survey of the present state of knowledge in Russia and abroad of the condition of the soil known as 'flax sickness', which his recent investigations have shown to be mainly due to the accumulation in the soil of fungi parasitic on flax, e. g., *Colletotrichum lini*, *Fusarium lini*, *Thielavia basicola*, and others [*R.A.M.*, ix, p. 720], the author discusses the lines on which the problem of its control may be solved. Observations in widely separated flax-growing regions of Russia, as well as in Western Europe and North America, have shown that in soils continuously sown to flax 'flax sickness' occurs in from two to five years, and that it appears soonest in loose, moist, and warm soils rich in humus. In the usual field practice the moment of the appearance of the condition is difficult to determine, owing to its being frequently masked by a more vigorous state of the surviving plants, this rendering crop yields in fibre and in seed an unreliable criterion. As established by the author, the organisms responsible for the disease can persist in the soil for at least six years, a fact which, unless immune or resistant varieties of flax are evolved and effective means are found for the disinfection of the soil, makes crop rotation systems of a shorter duration unsafe. So far no soil disinfectant is known that is both cheap and does not injure the flax plants, but promising results were obtained in preliminary experiments with copper sulphate, formalin, and particularly toluol which, in pots with heavily infected soil, reduced the rate of mortality of the flax seedlings from 74·7 to 7·8 per cent. In some localities of Russia a fair measure of control was occasionally observed in fields where the vegetation was burnt before sowing the flax. Of 134 seed disinfectants tested, which included germisan, segetan, uspulun, and various German proprietary dusts, none gave satisfactory results; the only chemical which effectively controlled seed infection and did not impair the germination of the seed was concentrated sulphuric acid, in which the seed was dipped for three to five minutes and then washed in water.

Of interest is also the statement that in 1928 the author isolated a micro-organism [the nature of which is not indicated] which, when added to actively growing liquid cultures of *Colletotrichum lini*, immediately arrested the development of this fungus and killed it in twenty days. No further description is given of this organism, which is termed '*anti-Colletotrichum*'.

Fargher (R. G.), Galloway (L. D.), & Probert (M. E.). **The inhibitory action of certain substances on the growth of mould fungi.**—*Shirley Inst. Mem.*, Didsbury, ix, pp. 37–52, 1930.

After briefly noting the properties other than high antiseptic power desirable in any antiseptic which is to be generally adopted to protect textile materials against fungal attack, the authors sum-

marize the results obtained with numerous [named] substances and briefly describe the preparation of those previously unknown or uncommon. Most of the investigations were made with acetanilide and its derivatives, the anilides of acids other than acetic acid, and the organomercury compounds, these being tested against a selection from 180 mould fungi found on mildewed cloth, yarn, and raw cotton [see next abstract], and chosen either because they were of a type commonly present on cotton goods or because they were highly resistant to antiseptics; they comprised *Penicillium* spp., *Aspergillus* spp., *Fusarium* spp., *Rhizopus* spp., *Cladosporium herbarum*, and *Alternaria tenuis*. The results obtained are tabulated under the following headings: species of fungus, antiseptic used, and percentage concentration required to inhibit growth, allow slight growth, or allow unrestricted growth, respectively.

Of many substances found to be of outstanding toxicity to mould fungi, including salicylanilide, *o*-chloromercuriphenol, *o*-acetoxymercuriacetanilide, thallium carbonate, *p*-nitrophenol, and trichlorophenol, only salicylanilide is considered to be desirable for general use in the cotton industry; it is pointed out that solutions of this substance appear to be non-toxic to higher plants. [This paper also appears in the *Journ. Textile Inst.*, xxi, 6, pp. T245–T260, 1930.]

Galloway (L. D.). **The fungi causing mildew in Cotton goods.** —*Shirley Inst. Mem.*, Didsbury, ix, pp. 27–36, 1 pl., 1 fig., 1930.

In this account of investigations into the occurrence and characteristics of fungi found on mildewed cotton goods [cf. *R.A.M.*, vii, p. 580; ix, p. 36] the author states that three different grey cloths incubated for three months at 25° C. with moisture regains of 8·5, 8·9, and 9 per cent., respectively, showed no mildew, while other cloths with 9·5 and 10 per cent. moisture regains showed very little growth. Mildew growth may also be suppressed by maintaining a high concentration of carbon dioxide in the storage atmosphere, though this is impracticable for cotton goods except, perhaps, under special circumstances. Preliminary tests demonstrated that in equal parts of air and carbon dioxide the growth of certain cotton mildews is very considerably suppressed, air containing only 25 per cent. carbon dioxide exerting an appreciable effect in this direction.

Numerous mould fungi isolated from cotton goods are listed under the following headings: source, colour of stain (if any) produced when inoculated on to sterile grey cloth under test conditions, degree of acidity produced by growing pure cultures at 25° for one week on a 3 per cent. maize starch paste with litmus, and the amount of cellulose decomposition. Species of *Aspergillus* and *Penicillium* were the fungi most frequently found, 16 of the former and 14 of the latter being listed, as well as numerous identified and unidentified species of other genera. Brief notes are given on the classification of the genera concerned. [This paper also appears in the *Journ. Textile Inst.*, xxi, 6, pp. T277–T286, 1930.]

LEONCIO (J. B.). **The relation to Abacá, or Manila Hemp, of the Banana wilt fungus Fusarium cubense E.F.S.**—*Philipp. Agric.*, xix, 1, pp. 27–42, 2 figs., 1930.

Morphological and cultural studies [which are fully described] showed that the causal organism of banana wilt in the Philippines is similar to *Fusarium cubense* as described by Brandes. Inoculations further established that the fungus is capable of attacking abacá or Manila hemp (*Musa textilis*), but the symptoms on this host differ somewhat from those on Latundan bananas (*Musa sapientum* var. *cinerea*). The bunching up of the leaves [*R.A.M.*, ix, p. 384] and discoloration of the corm bundles (the most reliable symptom) are, however, equally pronounced on both hosts. Both abacá and banana seedlings may be infected by growing them in previously sterilized soil inoculated with a pure culture of *F. cubense*, or in naturally infected soil. Infection of abacá seedlings by *F. cubense* may further be secured by smearing the pionnotes of the fungus over pricks on the pseudo-stem and corm, but attempts at inoculation of uninjured, unfolded leaves and buds gave negative results. Infection was not followed by rotting of the heart.

It is stated that reports received from Reinking indicate that abacá plants introduced from the Philippines into Central America have become attacked by a disease which is without doubt the same as the banana wilt.

DOSDALL (LOUISE). **Diseases of Peonies.**—*Minnesota Horticulturist*, lvii, 8, pp. 229–234, 5 figs., 1929. [Received September, 1930.]

Brief notes are given in popular terms on the symptoms and control of a number of diseases of peonies in Minnesota, the most prevalent and damaging of which is *Botrytis* [*paeoniae*: *R.A.M.*, ix, p. 723]. This usually occurs in early spring, especially when warm, damp weather prevails. Control consists in improved cultural practices [which are indicated] designed to reduce the amount of inoculum and render the environmental conditions unfavourable to the organism. In the spring, when the shoots first show, the soil may be sprayed lightly with Bordeaux mixture, mercuric chloride, or an organic mercury compound, while after the plants have bloomed they should be sprayed with Bordeaux mixture several times during the season to prevent leaf infections.

Phytophthora blight [*P. paeoniae*: ibid., viii, p. 244], the symptoms of which closely resemble those of *Botrytis* blight, also occurs only under moist, humid conditions, and is amenable to similar methods of control. Plants subject to repeated attacks should be removed to a drier situation.

Various [unspecified] leaf spots are also prevalent but are not usually of much consequence and are controlled by the treatment recommended against *Botrytis* blight.

WINTERS (R.). **Varietal susceptibility of the Peony to Botrytis paeoniae.**—*Phytopath.*, xx, 6, pp. 523–525, 1930.

In an experiment conducted during 1929 at Cornell University, Ithaca, New York, to test the reaction of a large number of peony

varieties to *Botrytis paeoniae* [see preceding abstract], 58 were classed as resistant, 97 as moderately resistant, 58 as susceptible, and 13 as very susceptible (commercially useless). The names of the varieties in each group are given.

BONGINI (VIRGINIA). **Le macchie fogliari del Ciclamino (Phyllosticta cyclaminis Brun.).** [Leaf spot of Cyclamen (*Phyllosticta cyclaminis* Brun.).]—*La Difesa delle Piante*, vii, 3, pp. 4–9, 3 figs., 1930.

In November, 1929, *Cyclamen persicum* plants in glasshouses near Turin were affected by a leaf spot causing defoliation. Brown spots appeared, usually near the margins, later showing concentric light and dark zones, and attaining 3 cm. or more in diameter; later, they became confluent, and caused a large area of the leaf blade to wither. Numerous immersed pycnidia, averaging 120 μ in diameter, developed in the centre of the spots and liberated long, dense cirrhi of hyaline, ovoid, continuous, often guttulate spores, measuring 6 to 8 by 2 μ. The fungus [the cultural characters of which are described] is identified as *Phyllosticta cyclaminis* Brun.

Spores obtained from pycnidia developed in culture and placed on the leaves of *C. persicum* gave rise, under greenhouse conditions, to typical lesions, but in the open, even when humidity was favourable, infection did not take place on days when the minimum and maximum temperatures were, respectively, 10° to 11° and 18° to 19° C.

Notes are given on a perithecial form which the author found accompanying the pycnidia on old leaves preserved in the laboratory and which she believes to be the perfect stage of *P. cyclaminis*. The perithecia are about 300 μ in diameter with 8-spored paraphysate asci, averaging 60 by 16 μ. The ascopores are hyaline, ellipsoidal, uniseptate, very slightly constricted, usually somewhat pointed at the ends or with one cell larger and rounded and the other smaller and pointed. It is thought to be an undescribed species and is provisionally named *Didymella cyclaminis*.

TILFORD (P. E.). **A Rhizoctonia disease of Sweet Alyssum.**—*Phytopath.*, xx, 7, pp. 587–590, 1 fig., 1 graph, 1930.

In July, 1927, sweet alyssum (*Alyssum odoratum*) at Wooster, Ohio, showed a progressive rotting and shrivelling of the leaves, accompanied by the development of definite lesions on the stems, which usually died above the point of infection. A species of *Rhizoctonia* was isolated from the diseased plants and compared with other strains of the same fungus from potato, aster, and chrysanthemum. The sweet alyssum organism formed abundant brown to black sclerotia and grew somewhat more rapidly at 30° and 15° C. than the aster and chrysanthemum strains; all three developed quicker than *R.* [*Corticium*] *solani* from potato, especially at 30°. Zonation was absent in the sweet alyssum strain, but present in all the others. Notwithstanding these variations the alyssum fungus is identified as *C. solani*. Good control was obtained by two applications of 4–6–50 Bordeaux mixture.

CHESTER (K. S.). **The Phytophthora disease of the Calla in America.**—*Journ. Arnold Arboretum*, xi, 3, pp 169–171, 1930.

Early in January, 1930, about one hundred Calla lilies (*Zantedeschia aethiopica*) in a greenhouse in Massachusetts were found to be suffering from a disease characterized by stunting of the blossom stalks, death of the leaves, and partial or total decay of the roots. Most of the flowers showed a brown discoloration of the distal portion of the spathe which ruined their commercial value. Both healthy and decayed roots sprang from the same region of the corm, which also showed more or less extensive rotting. Partially affected roots presented a glassy, translucent appearance between the normal and the rotted portions, accompanied by a slight red spotting.

The fungus isolated from the diseased plants was identified by Dr. C. Buisman as *Phytophthora richardiae* [see below, p. 809]. The disease is not known to have occurred in America before 1930 when, in addition to the above-mentioned record, Weiss also reported it from New York, New Jersey, and probably California (*Flor. Exch.*, lxxiii, p. 11). Good control of the disease in Massachusetts was obtained by excision of the infected parts and treatment of the corms with formalin (1 to 50).

ZIMMERMANN (H.). **Uropyxis mirabilissima Magn. (Puccinia mirabilissima Peck.). Eine für Europa neue Rostart an Mahonien.** [*Uropyxis mirabilissima* Magn. (*Puccinia mirabilissima* Peck.). A rust species new to Europe on species of *Mahonia*.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, x, 6, pp. 44–45, 3 figs., 1930.

In 1927 some *Mahonia* [*Berberis*] *aquifolium* bushes at Rostock (Mecklenburg) were found to be attacked by *Uropyxis* (*Puccinia*) *mirabilissima*, not known before in Europe [but see *R.A.M.*, ix, p. 530]. Since then the rust, which had probably been present for a number of years without attracting attention, has been observed in various other parts of the province. Following the severe winter of 1928–9 the development of the *Berberis* bushes was greatly retarded, and new shoots only appeared towards the autumn. The uredospores of the rust were detected on the young leaves in October, 1929, and heavy infection occurred early in December. Teleutospores were produced from the middle of December until the spring, during which period the weather conditions were relatively mild. The aecidial stage of *P. mirabilissima* has not been detected in the localities under observation.

HORSFALL (J. G.). **A study of meadow-crop diseases in New York.**—*Cornell Agric. Exper. Stat. Memoir* 130, 139 pp., 20 figs., 7 graphs, 1 map, 1930.

In this report, which is the outcome of an investigation in 1928, an account is given of the more prevalent diseases in the State of New York of meadow fodder plants, including meadow and lawn grasses, clovers, lucerne, and vetch (*Vicia villosa*), which are stated to be of considerable economic importance. The study comprises a description of the diagnostic characters of each disease, the life-

history and taxonomy of the causal organisms, and an account of experiments in the control of the diseases by means of fungicides. The essential features of the 29 diseases described are presented in a table at the end of the memoir. A description is also given of a method elaborated by the author for the estimation of the losses caused by the various diseases. Red clover and lucerne were computed to have suffered a reduction of yield, in 1928, of 180,217 and 46,756 tons, respectively, representing a monetary loss of approximately $3,160,000 on these two hay crops alone.

The bibliography appended comprises 244 titles.

JONES (F. R.). **Bacterial wilt of Alfalfa.**—*Journ. Amer. Soc. Agron.*, xxii, 6, pp. 568–572, 1930.

The most successful of the methods so far tested by the author for the determination of resistance to bacterial wilt [*Aplanobacter insidiosum*] in lucerne plants [*R.A.M.*, ix, p. 655] involves the inoculation of wounds made in roots when transplanted from the greenhouse to the field in the spring. Seeds of several varieties were sown in the greenhouse in October, 1928; on 17th April, 1929, the seedlings were removed from the soil, washed, and the roots scraped with a knife. The knife edge was drawn twice down the tap-root with sufficient pressure to remove the outer bark to about the same depth that it is sloughed after winter injury. The roots were then dipped in a bacterial suspension and planted in rows in the field. There was little evidence of disease until the third cutting, when the differences in the severity of infection in the several varieties became conspicuous. The Ladak, Turkestan [see next abstract], and Hardistan varieties showed a much higher degree of resistance and capacity to outgrow infection than Grimm, Kansas, and Peruvian. Further tests on a more extensive scale are in progress.

JONES (F. R.). **Bacterial wilt of Alfalfa in Turkestan.**—*Plant Disease Reporter*, xiv, 14, p. 125, 1930.

The author has isolated from wilted lucerne material collected in Turkestan by Westover and Whitehouse in 1929 an organism closely resembling the cause of the bacterial wilt (*Phytomonas* [*Aplanobacter*] *insidiosum*) [see preceding abstract], not previously known outside the United States. The only cases observed occurred north of Bokhara. Inoculation experiments in the greenhouse with the Turkestan strain of the bacterium resulted in the development of the characteristic wilt symptoms, the causal organism being re-isolated from the infected plants. Plants of a strain of Turkestan lucerne contracted the disease more slowly or not at all.

BARKER (J.). **Wastage in imported fruit: its nature, extent and prevention.**—*Dept. Sci. & Indus. Res., Food Invest. Board, Special Rept.* 38, vi + 62 pp., 9 pl., 5 graphs, 1930.

This report, which is the outcome of surveys from 1926 to 1929, gives brief descriptions of the chief types of wastage in imported fruit in England and of the losses caused by them, together with recommendations as to the methods most suitable for their preven-

tion. The various forms of wastage are dealt with under the individual fruits. Those of apples include internal breakdown (low temperature type), bitter pit, superficial scald, soft scald (involving not only the skin but also the underlying flesh), Jonathan spot, brown heart, over-ripeness, fungal rotting, etc. Wastage in pears may be due to over-ripeness, core breakdown and scald [*R.A.M.*, ix, p. 726], fungal rotting, and abnormal ripening; in plums and peaches chiefly to physiological breakdown, over-ripeness or conditions simulating this, and fungal rotting; in grapes to dropping and fungal rotting. In citrus fruits the fungal rots discussed are blue and green moulds (*Penicillium italicum* and *P. digitatum*), stem-end rot caused by *Diplodia* [*natalensis*] and species of *Phomopsis* [ibid., viii, p. 249], centre rot (*Alternaria citri*), and brown spots on the skins of oranges and grapefruits caused by a variety of fungi. The bulk of the wastage in bananas is caused by stalk-rot and finger-rot [ibid., ix, p. 729], the former of which is a decay of the main stalk of the bunch developing either from the basal or the apical end, and the latter a blackening and rotting of the stalks of the individual bananas of a 'hand', which eventually severs them from the stem. In pineapples the forms of wastage considered are stalk-rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) and low temperature wastage, and in tomatoes two types of fungal rot.

A special chapter is given to the discussion of the factors that promote or contribute to the development of the various forms of wastage during sea transport, such as temperature, the accumulation of carbon dioxide, and humidity in the holds, and the emission of toxic products by the fruit itself. This is followed by a brief survey of the wastage that arises during the marketing of the imported fruit, the results of which show the necessity of a rapid disposal of the fruit after landing and of improvements in the handling and storage of the fruit pending sale. The paper terminates with a brief discussion of the most suitable methods of prevention of wastage in the orchards, in pre-shipment storage, and during transit, in which it is stated that much further work in this direction is required.

A useful bibliography of 60 titles is appended.

Barker (J.). **The prevention of wastage in New Zealand Apples.**—*Dept. Sci. & Indus. Res., Food Invest. Board, Special Rept.* 39, v + 26 pp., 11 graphs, 1930.

Details are given of a large number of experiments in 1928 and 1929, the results of which indicated that wastage in New Zealand apples during transit and immediately after landing was markedly affected by the temperature at which the apples were kept during the voyage. Fungal rots (which are stated to be the chief cause of wastage) and bitter pit increased in importance as the temperature during carriage was higher, while internal breakdown and soft scald [see preceding abstract] developed at carriage temperatures which, though slightly above the freezing-point of the fruit, were still too low for the varieties concerned. There was also evidence that the storage and sea transport temperatures accepted as most suitable for particular varieties of apple are not in all

cases correct, further experiments in this direction being required. From a practical point of view, the experiments indicated that, in order to obtain the best results, a rapid reduction of temperature in the holds after loading and the maintenance of a uniform temperature close to the optimum low value for each individual variety are essential.

A discussion is also given of the effects on the different forms of wastage of some pre- and post-shipment factors, such as the time of picking, delay before loading, pre-cooling, and delay in marketing, in the light of the information obtained from the investigation, and recommendations are made for the improvement of conditions in ship holds.

FAES (H.), STAEHELIN (M.), & BOVEY (P.). **La lutte contre les parasites des arbres fruitiers, insectes et champignons, en 1929.** [The control of insect and fungous parasites of fruit trees in 1929.]—*Annuaire Agric. de la Suisse*, xxxi, 2, pp. 109–122, 1930.

Notes are given on experiments in the control of various common fruit diseases during 1929. In the treatment of scab (*Fusicladium*) [*Venturia inaequalis*] on apple trees in the Viticultural Experiment Station, Lausanne, 1 per cent. Bordeaux mixture, especially in a neutral or slightly acid state, caused considerable russeting, particularly on the Transparente Croncels and Baumann's Reinette varieties [*R.A.M.*, viii, p. 796]. Good combined control of pear scab [*V. pirina*] and fruit moth [*Cydia pomonella*] was given by 1 per cent. Bordeaux mixture, 2 per cent. fungol + 2 per cent. summer Volck, and 1·5 per cent. nosprasen, while the fungus alone was also well controlled by 1 per cent. solbar and 1 per cent. nosprasit.

Shot hole of cherry (*Clasterosporium*) [*carpophilum*: ibid., ix, pp. 465–467] was satisfactorily controlled by two applications of 1 per cent. Bordeaux mixture and the same fungus on plums by three applications of this preparation.

BAGENAL (N. B.), GOODWIN (W.), SALMON (E. S.), & WARE (W. M.). **The control of Apple scab. I. Bramley's Seedling and Newton Wonder.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxvii, pp. 186–194, 3 figs., 1 plan, 1930.

In 1924, Bramley's Seedling apple trees in an orchard severely affected by scab (*Venturia*) [*inaequalis*: *R.A.M.*, ix, p. 40] the year before, when given three applications of home-made Bordeaux mixture (8–25–100) showed 53 per cent. clean fruit, two other plots after two applications showing, respectively, 37 and 27 per cent. clean fruit. Three applications of 1 in 30 lime-sulphur on two other plots gave, respectively, 32 and 25 per cent. clean fruit, while three applications of the same with lead arsenate (4 lb. per 100 galls.) gave 52 per cent. clean fruit. Only 4 per cent. clean fruit was obtained from the unsprayed controls.

Further tests were made on the same trees the year following, when three applications of the Bordeaux mixture gave 64 and 54 per cent. clean fruit on the two plots, respectively, as against 53 and 49 per cent., respectively, for two applications. Three applica-

tions of lime-sulphur gave 61 and 51 per cent. clean fruit, as compared with 60 and 39 per cent., for two applications, respectively. Three applications of lime-sulphur with lead arsenate gave 57 and 49 per cent. clean fruit, the corresponding figures for two applications being 52 and 48 per cent., respectively. The two unsprayed control plots showed, respectively, 38 and 30 per cent. clean fruit.

In 1925, Newton Wonder trees in the same orchard were similarly sprayed. Three applications of the Bordeaux mixture on two plots gave, respectively, 89 and 83 per cent. clean fruit, two applications giving, respectively, 75 and 74 per cent. clean fruit. The corresponding figures for three and two applications of lime-sulphur each on two plots were 88 and 84, and 89 and 87 per cent., respectively. Three and two applications of lime-sulphur lead arsenate each on two plots gave 87 and 83, and 87 and 69 per cent. clean fruit, respectively. The unsprayed control plots showed 78 and 68 per cent. clean apples, respectively.

Except on one plot in one season the addition of lead arsenate did not increase the fungicidal value of the lime-sulphur. In both years the lime-sulphur caused scorching and occasional slight leaf fall on the Newton Wonders, on which the lime-sulphur lead arsenate also caused scorching with occasional severe leaf fall.

Goodwin (W.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab. II. Allington Pippin and Newton Wonder.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxvii, pp. 195–201, 1 pl., 1930.

In spraying tests against apple scab [*Venturia inaequalis*] conducted in 1929 [see preceding abstract], Allington Pippins after receiving three applications of Bordeaux mixture (8–12–100) showed 13 per cent. scabbed fruit; the corresponding figure for other trees of this variety given the Bordeaux mixture at the pink-bud stage, followed by two post-blossom applications of 1 in 60 lime-sulphur, was 8 per cent. In three unsprayed control plots the corresponding figures were, respectively, 80, 80, and 70 per cent. Newton Wonders given three applications of Bordeaux mixture showed 26 per cent. scabbed fruit; given one application of Bordeaux mixture followed by one post-blossom application of lime-sulphur they developed 51 per cent. scabbed fruit. Three unsprayed control plots showed respectively, 68, 86, and 83 per cent. scabbed apples.

The application of the lime-sulphur to the Newton Wonders immediately after petal fall resulted in defoliation. The two applications of lime-sulphur following Bordeaux mixture gave no better 'finish' to the Allington Pippins than did three applications of Bordeaux mixture. The Bordeaux mixture caused no appreciable russeting on either variety.

Central stationary spray plant. Overhead spray system successful in Tasmania.—*Fruit World of Australasia*, xxxi, 6, p. 225, 1930.

Particulars are given of an overhead stationary spraying system [*R.A.M.*, viii, p. 658] installed at a cost of approximately £400 on

a 25-acre apple orchard in Tasmania, and which has reduced the time spent in actual spraying to less than half. Two 140-gallon vats are used, the supply during spraying being drawn from one while the other is being got ready. Two Myers double-action pumps, which can get pressures up to approximately 300 lb., draw the spray from the vat and force it round the circuit of pipes. One person at the supply end can work the 5 h.p. electric motor that supplies the power. The ¾ in. galvanized tested pipes run through the orchard at distances of about 200 ft., and the ½ in. screw bibs or 'hose ring taps' are approximately 200 ft. apart on the piping. The hose is used in 120 ft. lengths, four lengths being used simultaneously from each run of piping. Among the larger trees the pipe is about 7 ft. above the ground, and among the younger ones it is carried on long stakes, so that any vehicle can easily pass underneath.

PITTMAN (H. A.). **'Black spot' or 'scab' of Apples and Pears in Western Australia.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser. vii, 2, pp. 241–263, 11 figs., 1930.

In April, 1930, the author was shown a few Cleopatra apples badly affected with scab (*Venturia inaequalis*), this constituting the first unquestionable record of the disease in Western Australia; later on several other varieties were found to be affected in the same orchard and cases were observed on Granny Smith apples from an orchard 100 miles away. In both areas vigorous control measures were at once applied. Owing to the comparatively dry summers experienced in the apple-growing parts of Western Australia it is hoped that the disease, should it become endemic, will be less serious than elsewhere.

Full notes are given in popular terms both on this disease and pear scab (*V. pirina*) and their control, a complete spraying schedule being outlined.

Calcium sulphide for scab and brown rot.—*Better Fruit*, xxiv, 11, p. 9, 1930.

After referring to the encouraging results recently obtained in Virginia in the control of apple scab [*Venturia inaequalis*], peach scab [*Cladosporium carpophilum*], and peach brown rot [*Sclerotinia americana*] by spraying with calcium sulphide [*R.A.M.*, viii, p. 512], the author cites a communication received describing an experiment in which this mixture was tested on Anjou pears in Oregon against wettable sulphur and lime-sulphur solution.

The fruit sprayed with the calcium sulphide showed less than 1 per cent. scab [*V. pirina*], with no trace of russeting or foliage injury; it had a clear, bright finish, and was greatly superior to the fruit given either of the other treatments. The value of the calcium sulphide mixture was enhanced by the ease of its preparation and its good keeping qualities under air-tight conditions.

DAY (L. H.). **Zinc chloride treatment for Pear blight cankers.**—*California Agric. Extens. Service Circ.* 45, 13 pp., 1930.

This circular gives detailed instructions for the preparation and application of the zinc chloride treatment for the control of pear

blight [*Bacillus amylovorus*] recommended in a previous publication [*R.A.M.*, vii, p. 791]. Briefly the treatment consists in soaking the bark of the roots, trunk, and branches bearing blight cankers with one or other of three concentrations (53, 43, and 33 per cent., respectively) of zinc chloride in a solvent consisting of a mixture of water, concentrated hydrochloric acid, and denatured alcohol, the concentration used depending on the age and size of the organ treated and on weather conditions. It is pointed out that primarily the treatment is intended for new cankers on large limbs and the trunk, but it can also be used advantageously on the smaller branches to save the fruit, if time and labour conditions are not a consideration. Stress is laid on the necessity of a careful inspection of all the treated cankers, and of repeating the treatment whenever the cankers show signs of fresh development.

The treatment is stated to be the most effective method now existing of saving pear trees affected with blight, and to have been successfully used by many growers over a period of three to five years ; it must, however, be properly applied and has its limitations, and should therefore be supplemented with the usual measures for the eradication of the disease from the orchards.

VOGLINO (P.). **Erpete furfuracea delle Pere (Macrosporium epicarpium MacAlp.)** [Furfuraceous herpes of Pears (*Macrosporium epicarpium* MacAlp.).]—*La Difesa delle Piante*, vii, 3, pp. 1–3, 1930.

Early in 1930, pears of various [named] varieties, especially Passa Crassana gathered in the previous November, showed the sparse, small, corky lesions with radial cracks due to *Macrosporium epicarpium* [*R.A.M.*, vii, p. 383]; occasionally, slight portions of the flesh decayed owing to secondary invasion by *Penicillium crustaceum*. In well-developed lesions a fuliginous stroma was seen, from which arose septate, erect conidiophores, fuliginous at the base, hyaline at the apex, measuring 60 to 80 by 4 to 6 μ, and bearing olivaceous or dark-fuliginous, clavate or elongated-clavate conidia divided by 4 to 6, usually 5, transverse, and numerous longitudinal or oblique septa, and measuring 30 to 55 by 9 to 14 μ.

Artificial inoculations of pears gave rise to corky lesions with some softening of the underlying flesh and, in some cases, the development of moulds, chiefly *P. crustaceum*.

MAIER-BODE. **Die Kräuselkrankheit der Pfirsiche.** [Leaf curl of Peaches.]—*Gartenflora*, lxxix, 7, p. 234, 1930.

In consequence of the damp, cold spring of 1930, peaches in Germany suffered severely from leaf curl (*Taphrina deformans*), the control of which by the application of solbar (3 per cent. before the buds burst and 1 per cent. just before and ten days after flowering) is recommended.

MARTIN (H.). **The defoliation of Gooseberries by sulphur-containing sprays.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxvii, pp. 182–185, 1930.

When young Leveller gooseberry bushes were sprayed twice

with 1 to 60 lime-sulphur or the same combined with 0·7 per cent. commercial aluminium sulphate or were sprayed with 1 in 30 lime-sulphur with and without 1·4 per cent. aluminium sulphate, marked defoliation followed all the treatments [cf. *R.A.M.*, ix, p. 663]. Similar results were obtained from the 1 in 60 lime-sulphur alone or with 0·7 per cent. aluminium sulphate on Early Sulphur and Golden Drop, but the effect on Yellow Bell was less marked. It was evident that the addition of aluminium sulphate had not appreciably affected the defoliation of these varieties by the lime-sulphur. No deleterious effects were produced on Crown Bob and Cousen's Seedling; on Careless no defoliation took place, but the sprayed leaves were more bronzed than the others.

In a further test other Leveller bushes were given an application of 3 per cent. dry mix sulphur lime, or 0·4 per cent. 'ialine' colloidal sulphur with 0·5 per cent. soft soap spreader, 1 in 30 lime-sulphur again being used for comparative purposes. Within a week, more or less severe defoliation was apparent on all the bushes.

These results, it is considered, do not confirm the view that the soluble sulphides in the lime-sulphur are responsible for defoliation, but suggest that elementary sulphur is the responsible agent.

Alcock (Mrs. N. L.), Howells (D. V.), & Foister (C. E.). **Strawberry disease in Lanarkshire.**—*Scottish Journ. of Agric.*, xiii, 3, pp. 242–251, 3 pl., 1930.

In the first part of this paper (by D. V. Howells) it is stated that the Lanarkshire strawberry disease [*R.A.M.*, ix, p. 44] made its first noticeable appearance in 1920, since when it has spread rapidly. The first serious outbreak was observed in a one-year-old plantation on moderately light soil of good depth, and practically every holding set with plants from this source has remained contaminated. Careful observations have shown that new land, even on farms where strawberries were never previously grown, has become infected by the use of diseased plants, by implements, through the agency of workers, and by other points of contact. The disease is prevalent in many parts of Scotland on fruit farms and in private gardens, infection by means of introduced plants being almost always traceable.

Diseased plants are usually first observed in the lower part of the field towards the middle of May. The plants present a shrunken, stunted, and scorched appearance, the last-named symptom being most conspicuous in varieties with abundant foliage. The root system is badly developed, with comparatively few rootlets and much diseased tissue. Many of the roots have a red core, the presence of which has become the growers' field test for disease. A prolonged wet period in late July or August leads to extensive autumn spread and winter killing. The disease is most severe on light soils.

The outcome of experimental work on the control of the disease in the greenhouse and field indicated that no permanent benefit is to be expected from spraying, though temporary control was given by lime-sulphur. Partial control was obtained by sterilization of

the soil with cresylic acid. No marked improvement followed the adoption of any special methods of cultivation or manurial treatments. The root system of the plants benefited greatly by the application of lime on heavy soils, but on light ones the effects of lime were either negligible or positively detrimental. Heavy applications of stable manure appeared to increase the incidence of the disease. The isolation of infected areas acted as a temporary check. None of the varieties tested showed any conspicuous degree of resistance.

In the second part of this paper Mrs. N. L. Alcock and C. E. Foister describe their observations on the *Phytophthora*, reported by Ashby to be closely allied to *P. cinnamomi* [ibid., ix, p. 291], to which they attribute the 'red core' disease.

The organism is confined to the roots which are characterized by a conspicuous absence of fibrous rootlets, accompanied in the early stages of the disease by a pale greyish, quasi-transparent appearance of the tips. Another early sign of infection is the occurrence of long dark roots of an india-rubber-like consistency, with no lateral roots. At a slightly more advanced stage the points, and often half the root, are black and shrivelled. Under wet conditions the attacked portion rots off, leaving the central cylinder like a coarse hair protruding from the stump. The reddening of the latter, probably due merely to the presence of oxidase, is usually accompanied by the presence of large numbers of spores lying along the vascular bundle. Continuing the examination of diseased material to which reference has already been made [loc. cit.] 650 plants were inspected during the period from October, 1929, to June, 1930; of these 400 contained oospores measuring 33 μ lying in an oogonium averaging 44 μ in diameter. The lemon-shaped sporangia vary greatly in size, some reaching 70 μ in length while others are only 50 μ long. A characteristic feature of the fungus is the growth of a second sporangium from the base of the first after the discharge of the zoospores by the latter. This process may be repeated more than once. The oospores are formed both by amphigynous and paragynous fertilization. The occurrence of chlamydospores was also observed. All attempts to obtain pure cultures of the fungus on 30 kinds of media have given negative results.

The addition of fragments of infected roots to a pan of sterilized sand containing young, healthy strawberry runners resulted in the development of the typical symptoms of the Lanarkshire disease, and the above-mentioned fungus was found in the central cylinder of the affected roots; control plants grown in sterilized soil without the addition of diseased material remained healthy. Further confirmatory evidence that this *Phytophthora* is the causal agent is furnished by the fact that the disease occurred on originally healthy plants, especially of a Belgian variety, grown in soil infested by the oospores of the fungus.

WARDLAW (C. W.). **The biology of Banana wilt (Panama disease). I. Root inoculation experiments.**—*Ann. of Botany*, xliv, 175, pp. 741–766, 35 figs., 1930.

This is a detailed, fully illustrated account of the experiments

which were made at the Imperial College of Tropical Agriculture, Trinidad, to determine the conditions under which *Fusarium cubense* becomes parasitic on the roots of the Gros Michel bananas, a condensed report on which has already been noticed [*R.A.M.*, viii, p. 797]. In addition to the information previously given, it is stated that the chemical composition and reaction of the soil have been shown not to be direct factors promoting infection of the roots, while infection, varying from superficial lesions to complete killing of the roots, invariably occurred under conditions of variable water supply. The histological examination of partly diseased roots indicated that further hyphal penetration by the parasite and the diffusion of its toxic secretions were prevented by the formation of protective suberized layers in the cortex, always disposed at right angles to the direction of diffusion of the toxic substances.

In concluding, the author states that in his opinion root infection is much less important than sucker infection, except where it occurs in proximity to the root-base, when sucker infection may result. The latter is regarded as the fundamental problem in considering the production of the major banana wilt symptoms.

MARTYN (E. B.). **British Guiana: Fusarium cubense discovered in the Colony for the first time.**—*Internat. Bull. of Plant Protect.*, iv, 7, pp. 101–102, 1930.

The causal organism of the Panama disease of bananas, *Fusarium cubense* [see preceding abstract], has recently been detected on wilted plantains (*Musa paradisiaca*), this being the first record of its occurrence in British Guiana.

SMITH (M. A.). **The control of certain fruit diseases with flotation sulphurs.**—*Phytopath.*, xx, 7, pp. 535–553, 2 figs., 1930.

A preliminary report is given on a new type of sulphur, called flotation sulphur (thylox, ferrox, and gray brands), obtained in the Koppers [*R.A.M.*, ix, p. 326] liquid purification process of manufactured gas.

The particles of flotation sulphur were found to be of uniform fineness, ranging from 1 to 5 μ in diameter, compared with 6 to 200 μ for those of ground sulphur [ibid., ix, p. 664]. The unwashed product caused injury to foliage owing to its content of the soluble impurities, sodium thiosulphate and sodium thiocyanate. No damage was caused, however, by flotation sulphurs washed free of impurities.

All the types of flotation sulphur used in 1929 at Barry, Illinois, gave adequate control of apple scab (*Venturia inaequalis*) on the susceptible Ben Davis variety, and imparted a good finish to the fruit. At Carbondale in 1929 the flotation sulphurs gave somewhat better control of brown rot of peaches [*Sclerotinia americana*: ibid., ix, pp. 463, 464] than did several brands of ground wettable sulphur. During 1927–8 and 1928–9, peach leaf curl [*Taphrina deformans*] in southern and central Illinois was well controlled by unwashed flotation sulphur in combination with an

experimental oil emulsion. All three types of flotation sulphur proved effective against leaf spot of cherries [*Coccomyces hiemalis*: ibid., ix, p. 394] in nursery and commercial plantings in 1929.

ROLET (A.). **Les soufres viticoles.** [Viticultural sulphurs.]—*La Vie Agric. et Rurale*, xix, 24, pp. 395–397, 1930.

The writer discusses some of the chief factors governing the efficacy of the sulphur preparations used for the control of downy mildew [*Plasmopara viticola*], *Oidium* [*Uncinula necator*], and other fungous diseases of the vine, with observations on the legal standards of purity in France [cf. *R.A.M.*, ix, p. 286].

GOODWIN (W.), MARTIN (H.), & SALMON (E. S.). **The fungicidal properties of certain spray-fluids, VII.**—*Journ. Agric. Sci.*, xx, 3, pp. 489–497, 1930.

In continuation of their studies on certain fungicidal spray fluids [*R.A.M.*, ix, p. 467], the authors give full details of their experiments to determine the percentage of polysulphide sulphur necessary for complete fungicidal action of the sprays, the results of which were discussed and summarized in a recent paper noticed in this *Review* [ibid., ix, p. 537].

ARTSCHWAGER (E.). **Dictionary of botanical equivalents. German-English.**—239 pp., 6 pl., London, Baillière, Tindall & Cox, 1930.

This considerably amplified edition of the German-English section of the author's well-known dictionary of botanical equivalents [first issued in 1920 by the Williams & Wilkins Company, Baltimore] contains various additional features, including lists of German abbreviations in common use, irregular German verbs, reference books and related dictionaries, English and metric units, and plates representing the terminology of various morphological and anatomical parts of plants and animals.

KOSTOFF (D.). **Tumours and other malformations on certain Nicotiana hybrids.**—*Zentralbl. für Bakt.*, Ab. 2, lxxxi, 8–14, pp. 244–260, 18 figs., 1930.

In this paper, which is primarily concerned with tumours manifested by the first generation of certain *Nicotiana* hybrids, the author presents new data on the cytology and etiology of the cancer phenomena in plants. Cancerous proliferations were manifested so frequently and abundantly by the progeny of *N. glauca* × *N. langsdorffii*, *N. tabacum wigandoides* × *N. sanderae*, and other cross combinations, that many of the plants died before reaching maturity. Certain other hybrids displayed no evidence of abnormal proliferation, indicating that this manifestation is limited to definite cross combinations. The largest tumours and most prominent fasciations were observed on the hybrid *N. glauca* × *N. langsdorffii*, the general aspect of the plants being reminiscent of the symptoms induced by crown gall (*Bacterium tumefaciens*) and of those observed in the callus region in interspecific and intergeneric grafts [*R.A.M.*, viii, p. 588]. Every possible transition occurred, from slight fasciations and witches' broom-like malformations with numerous branches to the real 'malignant' tumours.

The author's investigations [which are fully described] on the etiology of these tumours showed conclusively that no organism is involved. The tumours are formed chiefly of parenchyma, with the vascular bundles (if any) very irregularly distributed and composed of short unoriented cells. In the early stages the tumours show a tendency to grow on the surface by cell division, and at the base and in the interior by cell expansion. The degree of the latter is very remarkable, the average diameter of the expanded parenchyma cells in the tumours being two to three times greater than that of the normal cells of the pith parenchyma. Necrosis usually occurs in the regions where cell expansion has followed the cessation of cell division. The recurrence of cell division may be stimulated by the necrosis of only two or three layers of cells in certain regions, frequently leading to great irregularity of the outgrowths.

VASUDEVA (R. S.). **Studies in the physiology of parasitism. XII. On the effect of one organism in reducing the parasitic activity of another.**—*Ann. of Botany*, xliv, 175, pp. 557–563, 1930.

Referring to his previous experiments in which he induced *Botrytis allii*, normally non-parasitic on apple fruit, to attack the latter [*R.A.M.*, ix, p. 545], the author describes further work in which he showed that the parasitic action on apple of *Monilia* [*Sclerotinia*] *fructigena* is considerably reduced when the apple is inoculated with a mixed inoculum of this fungus and *B. allii*. A still greater reduction of the rotting capacity of the apple parasite was obtained when it was suspended, before inoculation, in the stale liquid derived from flask cultures of *B. allii* of varying ages, the inhibiting effect of the stale liquids increasing with their age and being correlated with the reduced capacity of the *S. fructigena* conidia to germinate and grow under such conditions.

Comparable results were also obtained in mixed inoculations of three other apple-rotting species, namely, *Botrytis cinerea*, *Sphaeropsis malorum*, and *Penicillium* sp., with six species of saprophytic fungi [which are specified], and with *Bacillus subtilis*, whereby it was shown that the reduction in the parasitic activity of the parasites was accentuated when they were introduced into wounds inoculated a few days beforehand with any one of the saprophytes. There was evidence to show that the reduced parasitism shown by mixed inocula may be explained on the basis of staling phenomena and that it does not indicate immunization of the apple tissues.

RIPPEL (A.) & KESELING (J.). **Über tanninzersetzende Mikroorganismen.** [On tannin-decomposing micro-organisms.]—*Arch. für Mikrobiol.*, i, pp. 60–77, 5 figs., 1930. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxi, 8–14, pp. 292–293, 1930.]

Of a number of fungi, yeasts, and bacteria isolated from soil samples, only *Penicillium*, *Citromyces*, and *Aspergillus* were able to grow with tannin as the sole source of carbon. The tannin was assimilated in its entirety by *Aspergillus*, but when sugar was also

present only half the tannin was used. A number of organisms were found to be capable of developing in the presence of tannin with another source of carbon, e.g., tannin-albumin compounds [cf. *R.A.M.*, iii, p. 315; viii, p. 281]. *P. luteum* formed more tannase than *A. niger*, but developed less freely than the latter in the presence of high tannin concentrations and assimilated relatively little tannin.

BREHMER (W. v.) & BÄRNER (J.). **Über die Viruskrankheiten der Kartoffel.** [On the virus diseases of the Potato.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xviii, 1, pp. 1–54, 1 col. pl., 31 figs., 1930.

In the central medullary cells of the older portions of potato stems affected by leaf roll, mosaic, and other degenerative manifestations, the authors found pale yellowish-green, oval amorphous bodies, surrounded by a distinct, refringent sheath with rounded ends, at one of which a bright, round dot was conspicuous. These bodies, which were subsequently found in all the parenchymatous tissues of diseased parts, measured 4·35 to 5·5 by 2·9 to 3 μ, and showed slight amoeboid changes in shape. Single mother bodies were observed to divide into as many as eight daughter bodies, each a replica of the parent, this process being accompanied by granulation. Within 20 minutes the numerous granules in each daughter body developed into refringent vesicles (spores) measuring 0·8 to 0·82 μ which were set free by the breaking up of the daughter bodies. Each spore then gave rise to a filamentous zoospore about 5 μ in length and a fraction of a micron in breadth. Similar bodies occurred in the diseased tubers and roots, and in the peat mould mixed with the soil in which the plants were grown. The medullary cells of the basal shoots developing in the autumn after the death of the leaves contained highly granular bodies measuring 3·3 μ in diameter with a sheath of the same dimensions, as well as smaller structures (2·47 μ). These bodies divided into as many as four daughter bodies and produced spores and zoospores as described above. Amoeboid bodies with a maximum diameter of 5 μ, and also spores measuring 0·45 μ and filamentous zoospores were further detected in the expressed sap of diseased plants filtered through a membrane filter suitable for the filtration of bacteria 0·75 μ in diameter, and in plants to which the different virus symptoms had been communicated by grafting.

The bodies in question are considered to be either independent amoeboid entities capable of simultaneous spore formation, or plasmodia maintaining a relationship of symbiotic parasitism with the plastids. They possess certain analogies [which are indicated] with Jones's parasite *Calkinsi* [*R.A.M.*, vii, p. 810] and the 'X' bodies of various investigators [cf. ibid., viii, p. 735 *et passim*]. There is, however, a fundamental difference between the conclusions of other workers and those of the present writers, inasmuch as the former attribute the destruction of the chloroplasts, cell nuclei, and starch direct to the zoospores, whereas the latter refer the pathogenic action to the amoebae and their products of division.

Assuming that the present results are substantially correct, the causal organism of the virus diseases of the potato appears to

belong to a hitherto unknown systematic group of the Archimycetes allied to the Plasmodiophoraceae. It is provisionally named *Plasmodiophora solani*.

MAGEE (C. J.). **Virus or degeneration diseases of Potatoes.**—*Agric. Gaz. New South Wales*, xli, 6, pp. 405–412, 4 figs., 1930.

This is a popular account of the two virus diseases of potato, namely, leaf roll and mosaic, so far known to occur in New South Wales, of which the former is by far the more prevalent and serious. A survey in January and February, 1930, showed that in some districts not one crop was free from leaf roll, and counts as high as 60 to 70 per cent. of leaf roll plants were common; in localities, however, where seed selection was practised at the time of digging, the infections were rarely over 30 per cent. A brief description is also given of methods for the establishment and maintenance of stud seed plots [*R.A.M.*, ix, p. 332].

WHITEHEAD (T.) & CURRIE (J. F.). **Potato leaf roll. Development of secondary symptoms in the year of infection.**—*Journ. Min. Agric.*, xxxvii, 2, pp. 159–163, 2 pl., 1930.

To ascertain whether, under glasshouse conditions, secondary symptoms of potato leaf roll [cf. *R.A.M.*, viii, p. 805; ix, p. 198] may develop in the year of infection, a test [which is fully described] was conducted in which three healthy tuber pieces of the Kerr's Pink and Arran Comrade varieties were sown in pots in an aphid-free glasshouse on 19th November, 1928, the same number being potted at weekly intervals up to 9th February, 1929, when 10 aphids collected from plants affected with leaf roll were placed on the upper leaves of each of the 60 experimental plants, two more aphids being placed on each plant on 20th and 27th February, respectively. On 7th and 8th March the glasshouse was fumigated.

Typical secondary symptoms of leaf roll developed on all the Arran Comrade potatoes planted eight weeks or less before aphid infestation. Those planted nine to eleven weeks before infestation showed only primary symptoms, while the oldest series at first appeared to be normal but later also developed primary symptoms. In the Kerr's Pink variety secondary symptoms developed only in the plants sown not more than five weeks before infestation. At first the older series showed no symptoms, but by 25th March rolling of the upper leaves was noted in the six-weeks-old series, and ultimately all the plants followed suit. Each variety could then be divided into a set showing typical secondary symptoms and another with definitely primary leaf roll characters. Gradually, however, the older leaves of the primarily rolled plants rolled successively from the top to the base of the plants.

Infection was marked by an almost complete cessation of growth in length; axillary buds produced rosettes of leaves which after about one month also rolled. This fact suggests that one month is the minimum incubation period of the virus.

It is thought that the presence of secondarily infected plants in a crop affords a reliable index of the degree of infection of the

seed-stock only if the plants are known to have passed a certain critical stage of growth (varying with the variety) before aphid infestation occurred.

Smith (K. M.). **Transmission of Potato leaf roll.**—*Nature*, cxxvi, 3168, p. 96, 1930.

Commenting on Whitehead's observations in connexion with the efficiency of *Myzus circumflexus* as a transmitter of potato leaf roll [*R.A.M.*, ix, p. 738], the writer points out that this insect is almost exclusively confined to the greenhouse, whereas *M. persicae* is not only one of the commonest potato-feeding aphids in the field, but is a practically omnivorous feeder, having been recorded on 52 plant hosts. Besides attacking potato haulms, it is also commonly found feeding on sprouted tubers in store, a process which probably leads to extensive virus dissemination. There is, moreover, in the writer's opinion, a definite, if not an absolute, affinity between *M. persicae* and the potato leaf roll virus. *M. circumflexus* has the further disadvantage of secreting a toxin in its saliva which is apt to produce spurious mosaic symptoms in the Solanaceae.

Leszczenko (P.). **Wpływ mineralnego nawozenia na rozwój parcha na Ziemniakach.** [Influence of mineral fertilizers on the development of Potato scab.]—*Prace Wydziału Chorób Roślin Państw. Inst. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Section State Inst. Agric. Sci. in Bydgoszcz*], 9, pp. 15–23, 1930. [English summary.]

The investigation briefly reported in this paper was made for the purpose of testing the effect of mineral fertilizers on the development of common scab (*Actinomyces* spp.) and scurf (*Rhizoctonia* [*Corticium*] *solani*) of potato [*R.A.M.*, ix, p. 199]. Pot experiments in 1928 and 1929, in which tubers of the susceptible variety Münster were grown in a slightly acid garden soil inoculated with pure cultures of *C. solani*, showed that the incidence and severity of scurf were increased by the addition of physiologically acid fertilizers, and decreased when alkaline fertilizers were used. In field experiments in 1929 on light, sandy soil, with a nearly neutral reaction, the application of lime or physiologically alkaline fertilizers resulted in a heavy attack of common scab on the varieties Parnassia and Biala Krolowa, while applications of acid fertilizers slightly reduced the development of the disease, as compared with the controls. Applications of a compound fertilizer, consisting of 30 per cent. superphosphate, 30 per cent. ammonium sulphate, and 40 per cent. potassium salt, at the rate of 1,000 kg. per ha., reduced the attacks of common scab in the field, and increased those of *C. solani* in the pot experiments.

Köhler (E.) & Lemmerzahl (J.). **Ueber die Prüfung von Kartoffelsorten im Gewächshaus auf ihr Verhalten gegen den Kartoffelkrebs (Synchytrium endobioticum).** [On the testing of Potato varieties in the greenhouse for their reaction towards Potato wart (*Synchytrium endobioticum*).]—*Arb. Biol.*

Reichsanst. für Land- und Forstwirtsch., xviii, 2, pp. 177–188, 1 graph, 1930.

Full details, accompanied by tables, are given of the authors' tests (using the Glynne-Bryan and Spieckermann methods with Lemmerzahl's simplified technique) [*R.A.M.*, iii, p. 600 ; vii, p. 803 ; ix, p. 739], on the reaction of 100 newly developed potato varieties to wart disease [*Synchytrium endobioticum*].

Two characters possessed in varying degree by the different potato varieties were found to regulate the incidence of infection, namely, that of affording the fungus a suitable medium for the development of full infections (summer sori), and that of reacting to infection by the production of excrescences. Both these properties are influenced by a number of partial factors, one of which determines the number of so-called 'subinfections' [the term applied by Köhler to sori failing to reach maturity: ibid., vi, p. 502]. Generally speaking, the phenomenon of subinfection is almost exclusively associated with varieties that also show a slight degree of full infections. There is considered to be some evidence for the view that the property of permitting subinfections is a genotypical character.

Seventeen of the varieties tested showed neither full nor subinfections, but the authors doubt whether this absolute immunity would be maintained under all conditions. A number of other varieties proved commercially immune, i.e., they formed no excrescences during a period of 28 days under the conditions of the tests. In this group are included 9724 (R.), Juka (Pomeranian Seed Association), 2501 (Rd.), 238/28 (Gr.), 2312/41 (Gd.), Ado Nr. 1 (Dl.), and 51/22 (Lb.). The varieties U.A.A. 1093 (P.), J × H5 weiss (Dn.), 8334 (R.), 9517 (R.), and the well-known Dutch Roode Star were more or less susceptible.

Garbowski (L.) & Leszczenko (P.). **Sprawdzanie odporności Ziemniaków na raka ziemniaczanego, Synchytrium endobioticum (Schilb.) Perc.** [Potato tests for resistance to wart disease, *Synchytrium endobioticum* (Schilb.) Perc.]—*Prace Wydziału Chorób Roślin Państw. Inst. Gospod. Wiejsk. w Bydgoszczy* [*Trans. Phytopath. Section State Inst. Agric. Sci. in Bydgoszcz*], 9, pp. 3–13, 1930. [French summary.]

Brief details are given of greenhouse pot experiments during the winter of 1928–9 at Bydgoszcz to test the resistance to wart disease (*Synchytrium endobioticum*) of a large number of potato varieties reported to be immune or nearly immune from the disease. The results of the tests [made by Miss Glynne's method: *R.A.M.*, iv, p. 501] were so irregular, however, that it was decided to check them during the 1929 season by field trials in experimental plots, highly infected with the causal organism. These showed that a number of varieties which did not exhibit any signs of infection in the pot experiments were distinctly susceptible in the field.

The 81 [named] varieties, which were found to be susceptible either in the pot experiments or in the field, included four samples supplied as being well-known immune varieties, but subsequently found to be incorrectly named. It was also found that some

varieties classed from source as 'nearly resistant' proved to be highly susceptible in the field, this being especially the case with Rubia and Minister von Miquel, and the use of such varieties in wart disease-infected or threatened areas is strongly deprecated.

SOESMAN (J. G.). **Bezuiniging bestrijding 'streepkanker'. Izal vervangen door Caporit.** [Economizing in the control of 'stripe canker'. Izal replaced by caporit.]—*De Bergcultures*, iv, 28, p. 729, 1930.

A considerable economy has been effected in the treatment of stripe canker of *Hevea* rubber [*Phytophthora palmivora*] in some estates in Java by the substitution of 0·2 per cent. caporit [*R.A.M.*, vi, p. 405] for 4 per cent. izal [ibid., vii, p. 56]. The total cost of 180 l. (the quantity used daily by 360 tappers) of the latter solution is Fl. 7·92 compared with only Fl. 1·81 for the former, so that the saving resulting from the use of the equally efficacious caporit is appreciable.

GANDRUP (J.). **Bezuiniging bestrijding 'streepkanker'.** [Economizing in the control of 'stripe canker'.]—*De Bergcultures*, iv, 39, pp. 1034–1036, 1930.

Referring to Soesman's article on the advantages of caporit as compared with izal in the control of stripe canker of *Hevea* rubber [*Phytophthora palmivora*] in Java [see preceding abstract], the writer states that a 2 to 2·5 per cent. solution of izal (not 4 per cent.) is ample to secure complete disinfection, while 1 per cent. would probably suffice. The costs of the izal treatment as given by Soesman can therefore safely be halved. In a series of laboratory tests the writer found that izal alone and izal + caporit (50 : 36), at concentrations of 2, 4, 6, 8, and 10 per cent., gave absolute control of *P. palmivora*, whereas caporit alone was entirely ineffective at the lower strengths and only partially toxic at and above 6 per cent.

BEELEY (F.). **A recent outbreak of secondary leaf-fall due to Oidium heveae.**—*Quart. Journ. Rubber Res. Inst. Malaya*, ii, 2, pp. 61–65, 1 pl., 1930.

A tour of two districts in Malaya severely affected by rubber mildew (*Oidium heveae*) in 1929 showed that the amount of secondary leaf fall brought about by the disease during the period of normal refoliation of the trees seemed to be in proportion to the density of the foliage; trees in good soil bearing heavy foliage suffered from greater leaf fall than did others in poorer soil with lighter foliage. The fungus was present on the leaves of all the trees over 2½ years. The normal wintering period for the area concerned is from the first week of February to the first week of March, but owing to infection many of the trees were still recovering from the wintering period in April.

The area now known to be infected with mildew in Malaya comprises nearly all Selangor, Negri Sembilan, Malacca, and North Johore. The rainfall appears strongly to influence the severity of

the attack, especially on the leaves. In 1929 the average rainfall for the first three months in the districts concerned was approximately 19·5 in., and very little mildew was recorded; for the corresponding period in 1930 it averaged only about 9·6 in. and infection was much more prevalent. Up to the present, experience has shown that the climate of Malaya is unsuited to prolonged activity of *O. heveae*, with the result that extensive losses are not expected [cf. *R.A.M.*, ix, p. 606].

MURRAY (R. K. S.). **Sulphur dusting as a means of controlling Oidium.**—*Second Quart. Circ. for 1930, Rubber Res. Scheme (Ceylon)*, pp. 28–30, 8 pl., 1930.

An account is given of the methods used in, and the results so far obtained from, experiments in Ceylon in the control of rubber mildew (*Oidium*) [*heveae*: *R.A.M.*, ix, pp. 55, 556, 674] by sulphur dusting. A Dutch machine was used in which a small petrol motor drives a fan at high speed. The sulphur is fed into the fan chamber from a hopper with a feed regulator, and is blown up through a chimney. The sulphur used (obtainable from the Estates Supplies Co., Ltd., Sourabaya, Java) is the higher grade of Kawah Poetih volcanic sulphur known as 'Flotate' sulphur; it is very finely divided and contains 90 to 95 per cent. sulphur (on dry sample) with a maximum moisture content of 5 per cent. Ten or twelve coolies suffice for the work, four carrying the machine, one maintaining the hopper half-full, and the remainder carrying the sulphur up from the dumps. Under Ceylon conditions an average area of 100 acres should be covered in a day.

On the experimental area five applications were made at 10- to 14-day intervals during refoliation after winter, a total quantity of 1,600 lb. of sulphur, or approximately 10½ lb. per application per acre, being used.

Though full control was not secured, the foliage of the dusted rubber was much superior to that of the undusted controls. In the dusted fields only 11 per cent. of the trees were completely defoliated, as compared with 53 per cent. of the controls. Correspondingly, 20 per cent. of the dusted trees were almost free from disease, as compared with only 3 per cent. of the controls.

On the basis of 100 acres per day the expenses were calculated as follows: 1,200 lb. sulphur at 6 cents per lb. = 72 rupees [£5 8*s.* 0*d.*]; 4 coolies to carry the duster at 60 cents = 2 rupees 40 cents; 6 coolies to carry the sulphur = 3 rupees 60 cents; 1½ galls, petrol-oil mixture = 3 rupees; total 81 rupees. The cost thus works out at 81 cents [nearly 1*s.* 3*d.*] per application per acre, excluding depreciation and special supervision, the chief item being the price of the sulphur.

[This paper also appears in the *Tropical Agriculturist*, lxxiv, 6, pp. 347–349, 1930.]

GOLLIEZ (G.). **Verslag omtrent de zwavelverstuivings-proeven op 15 Mei 1930 genomen op de onderneming 'Warnasarie' bij Bandjar voor de Rubber-Planters van Bandjar en omstreken.** [Report on the sulphur dusting experiments

conducted on 15th May, 1930, on the 'Warnasarie' estate near Bandjar for the Rubber planters of Bandjar and vicinity.] —*De Bergcultures*, iv, 30, pp. 784–787, 1 fig., 1930.

A detailed account is given of the construction and application of the Sulzer apparatus used for dusting *Hevea* rubber against mildew [*Oidium heveae*: *R.A.M.*, ix, p. 556], followed by notes on the results obtained in recent experiments with this method of control.

It is estimated that, running at low speed, the Sulzer apparatus can liberate 10 kg. of sulphur in six minutes, the corresponding figures for the normal and high speed working of the machine being 15 and 30 kg., respectively [cf. ibid., ix, p. 674]. Calculating the minimum amount of sulphur liberated per hour over an area of 6·67 hect. as 100 kg., the corresponding quantity for an average working day of 6 hours would be 600 kg. over 40 hect. In ten days it is therefore possible to cover an area of 400 hect. with one apparatus, two or three being required for areas of 800 and 1,200, respectively.

The dusting experiments were carried out with the 1930 model of the Sulzer apparatus, supplied by the firm of A.K.I.Z., the material employed being known as 'sulphur smoke, free flowing', from the Internatio. The Warnasarie estate is situated 60 m. above sea level. The weather during the tests was more or less cloudy with some rain, the temperature being about 28° C. The results of all three methods (low, normal, and high speed working) were very encouraging. The following amounts of sulphur were liberated: (1) low speed, 1·83 kg. per minute and 109·8 kg. per hour; (2) normal, 3·24 kg. per minute and 194·4 kg. per hour; (3) high speed, 3·75 kg. per minute and 225 kg. per hour. Using 10 kg. sulphur per hect., the areas covered per hour were as follows (in hect.): (1) low speed, 11; (2) normal, 19·4; (3) high, 22·5; with 15 kg. per hect. 7·35, 13, and 15 hect. per hour. A striking feature of the Sulzer apparatus is its extremely low consumption of benzine.

VOLLEMA (J. S.). **Meeldauw en bemesting.** [Mildew and manuring.]—*Arch. voor Rubbercult. Nederl.-Indië*, xiv, 6, pp. 260–274, 2 graphs, 1930. [English summary.]

This is a more detailed account of the author's investigations on the influence of manuring on *Hevea* rubber mildew [*Oidium heveae*] than that already noticed from another source [*R.A.M.*, ix, p. 336]. The outcome of the experiments indicated that manuring alone exercises little or no direct influence on the incidence of mildew. Effective manuring (with a combination of nitrogen, phosphoric acid, potash, magnesium, and lime) frequently causes an increase of infection by mildew, which is counteracted, however, by the beneficial action of these substances on the recovery and yield of the trees. In such cases the best results may be expected from combined manuring and sulphur dusting.

ZBORAY (E. v.). **Over de roode wortelschimmel.** [On the red root fungus.]—*De Bergcultures*, iv, 29, pp. 758–763, 1930.

The writer summarizes the principal literature on the red root

fungus (*Ganoderma pseudoferreum*) and discusses its systematic position and control, with special reference to the *Hevea* rubber plantations of Java. Bobilioff's method of exposing the roots and painting them with a mixture of tar and asphalt [*R.A.M.*, viii, p. 523] is expensive (about 50 cents per tree), and so far it appears to be of doubtful efficacy. The application of chemicals to the soil has also given inconclusive results, and the writer therefore recommends simply exposing the roots and leaving them without any further treatment except, of course, for the removal of infected material.

A brief note is given on the death of an 18-year-old rubber tree in which the white root rot fungus [*Fomes lignosus*: ibid., ix, p. 127] was found in conjunction with what were apparently the remnants of *G. pseudoferreum*. Although it was impossible definitely to identify the latter, there is considered to be little doubt that the red root fungus was the primary cause of the disease and the white one merely a secondary invader.

Weigand [K.]. **Die Braunspitzigkeit des Hopfens.** [The browning of Hop cones.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, viii, 5, pp. 102–105, 1 fig., 1930.

The browning of hop cones [*R.A.M.*, iv, pp. 241, 242] was found to occur at Pfaffenhofen (Bavaria) in a plot to which calcium nitrate was applied in 1928 and calcium cyanamide in 1929, while it was absent from ten other plots receiving other forms of treatment (including one to which calcium cyanamide was given in 1929 but no nitrogen in the preceding year). This is an indication (though the evidence is insufficient for a conclusive proof) that the browning of hop cones is favoured by an alkaline reaction of the soil. The plant, moreover, is known to thrive in slightly acid soils.

Martin (H.) & Salmon (E. S.). **Vegetable oils as fungicides.**—*Nature*, cxxvi, 3167, p. 58, 1930.

Absolute control of powdery mildew of the hop (*Sphaerotheca humuli*) [*R.A.M.*, ix, pp. 467, 468] was given in experiments at the South-Eastern Agricultural College, Wye, by olive oil, sesame oil, and cotton seed oil at the rate of 0·5 per cent. and by rape oil at 2 to 3 per cent., 0·5 per cent. soft soap being used as an emulsifier in each case.

Ikeno (S.). **Studien über einen eigentümlichen Fall der infektiösen Buntblätterigkeit bei Capsicum annuum.** [Studies on a peculiar case of infectious leaf variegation in *Capsicum annuum*.]—*Planta, Arch. Wissensch. Bot.*, xi, 2, pp. 359–367, 1 fig., 1930.

Full details are given of the writer's investigations, conducted at Tokyo, on the production of a variegated condition in the leaves of normal chilli pepper (*Capsicum annuum*) plants by means of grafting from variegated plants. This process was carried out as follows: the cut lateral surfaces of two branches, one from a normal and the other from a variegated plant, were brought into contact, each remaining on the mother plant until fusion was complete.

Of four plants obtained by this method in 1923, two were planted out in the open in the spring of 1924 while the others were left in pots. The two former developed a number of variegated leaves on the originally normal green branch, whereas in the latter there was no trace of mottling, the development of which seemed to be inhibited by pot cultivation. However, the progeny (110) grown from seed of the apparently non-variegated plants were all variegated, as also were 220 plants resulting from grafts between apparently normal green branches of the plants in which variegation was masked and normal green plants.

These data are considered to show that the form of variegation under discussion is an infectious chlorosis in Baur's sense [cf. *R.A.M.*, ix, p. 196]. It differs from all the types hitherto described in the consistency with which it is transmitted by the seed. This phenomenon is attributed by the author to the actual transmission of the diseased chloroplasts of the parents to the progeny, the pathological condition of the chloroplasts being due in its turn to the action of a virus generated by certain metabolic processes. Under unfavourable conditions, e. g., cultivation in pots, the virus remains latent, becoming manifest only when the plants are transferred to a better environment.

FREISE (F. W.). **Cane diseases and plagues in Brazil. Mosaic, sereh, iliau disease and gummosis the most prevalent—low yields attributed largely to losses caused by these agents.**— *Facts about Sugar*, xxv, 24, pp. 613–614, 1930.

Popular notes are given on sugar-cane diseases observed in Brazil. Mosaic disease is thought to be due to soil exhaustion. Plantations on virgin soil, even in proximity to infected fields, do not contract mosaic, but diseased canes planted in healthy fields form centres for the spread of infection. The disease does not increase in geometrical proportion, as would be the case in insect dissemination, but by arithmetical progression. When the rains in upper Minas cause the large rivers to swell and transport quantities of fertile humus soil, mosaic in the plantations of the lower Parahyba and Rio Doce declines or disappears. In parts of Rio de Janeiro deep cultivation, through the hard pan, was directly responsible for the reduction of mosaic infection to 20 per cent. of its former intensity. The P. O. J. 36, 213, 228, and 234 varieties have been found completely immune from mosaic, while among native canes San Pelo and Rosa have proved resistant. While the yield in mosaic-infected cane may be reduced by as much as 25 per cent., the average decrease in the sucrose percentage is only from 12·4 to 11·96 per cent. in the Taquara variety or from 12·9 to 11·3 per cent. in Riscada; in the more susceptible Cayanna a decline from 13·1 to 10·2 per cent. has been recorded. These data apply to the central highlands of San Paulo; in the Lorena district no loss of sucrose in diseased canes has been reported.

Sereh disease is stated to occur in San Paulo on the Preta, Rosa, Riscada, and Creolona varieties, the districts mainly affected being Piracaciba, Capivary, Lorena, and Igarapava. The susceptible varieties are in process of elimination.

Since 1925 the 'iliau' disease [*Gnomonia iliau*: *R.A.M.*, vii,

p. 600] has been observed near Araraquara and elsewhere in San Paulo on young plants of the Botelho Manteiga and San Pelo varieties. The natives call the disease 'colla-folha' (leaf-glueing) from the fact that the leaf sheaths surround and adhere firmly to the stalk, which turns reddish-blue and very flaccid. The peculiarly flavoured juice always shows a certain amount of lactic acid (0·04 to 0·13 per cent.) on analysis. So far the sole method of controlling this disease has been the abandonment and burning of the affected areas. Where infection is not severe the writer's tests have shown that the periodical application of 'blackwater' (dark coloured stagnant water from virgin forests, saturated with colloidally suspended humic acids) is immediately lethal to the fungus, completely restoring the vitality of the diseased canes within a few days.

Gummosis [*Bacterium vascularum*] has been known in Bahia since 1863 and in Pernambuco since 1890. The most susceptible varieties are Cayana, Canninha, Riscada, Cristalina, and Preta, and the only thoroughly resistant ones Manteiga and Taquara. Complete isolation and destruction by fire are the only effective control measures.

Diseases of minor importance are the following. Top rot [ibid., ix, p. 340] (believed to be a sequel to gummosis), which causes a red staining of the leaves and sheaths, accompanied by the yellow discoloration and death of the newest ones, which emit a disagreeable odour resembling formaldehyde. Stalk rot (*Colletotrichum falcatum*), which penetrates through the galleries of the moth borer, *Diatraea saccharalis*, or through rudimentary roots. Root rot (*Marasmius* spp., *Rhizoctonia* spp., *Schizophyllum commune* [ibid., i, p. 272], and other organisms), which causes chlorosis of the leaves of plants growing in shallow, sandy soils. Local damage is occasionally caused by *Ustilago sacchari* [*U. scitaminea*: ibid., ix, p. 745], *Melanconium sacchari*, *M.* sp., *Leptosphaeria sacchari*, *Phyllosticta sacchari*, *Helminthosporium sacchari*, *Cercospora vaginae*, *Cytospora* sp., and *Fusarium* sp. A brief note is given on *Myriogenospora aciculisporae* on P. O. J. 228 [ibid., vii, p. 537].

Cook (M. T.). **La situación actual en enfermedades de la Caña de Azúcar en Puerto Rico.** [The present situation as regards Sugar-Cane diseases in Porto Rico.]—*Rev. Agric. Puerto Rico*, xxiv, 12, pp. 227–231, 1930.

Popular notes are given on two groups of sugar-cane diseases, viz., those occurring in Porto Rico and those reported from other countries. To the former belong mosaic [*R.A.M.*, ix, p. 132], eye spot (*Helminthosporium ocellum*) [loc. cit.], ring spot (*Leptosphaeria sacchari*) [ibid., ix, p. 683], brown leaf spot (*Cercospora longipes*) [ibid., iv, p. 380], rot of the leaf sheath (*Cytospora sacchari*) [ibid., iii, p. 304], red spot of the leaf sheath (*Cercospora vaginae*) [ibid., vi, p. 148], adhesion of the leaf sheaths (*Odontia saccharicola*), red rot of the leaf sheath (*Sclerotium rolfsii*) [ibid., iv, p. 380], red stripe (*Phytomonas rubrilineans*) [ibid., ix, p. 406], pokkah boeng (*Fusarium moniliforme*) [*Gibberella moniliformis*: ibid., ix, p. 291], gummosis (*Bacterium vascularum*) [ibid., ix, p. 203], dry top rot (*Ligniera vascularum*) [ibid., viii, p. 603], red rot (*Colletotrichum*

falcatum) [ibid., ix, p. 809], pineapple rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., viii, p. 670; ix, p. 437], rind disease (*Melanconium sacchari*) [ibid., vi, p. 148], and root rots caused by *Pythium* and *Rhizoctonia* spp. [cf. ibid., vii, pp. 346, 601].

[Bell (A. F.).] **Cane pests and diseases.**—*Queensland Agric. Journ.*, xxxiii, 6, pp. 376–377, 1930.

In this note the Pathologist of the Queensland Bureau of Sugar Experimental Stations gives the boundaries of the nine quarantine districts into which the Queensland sugar-cane belt has been divided by a new proclamation issued under the recent Diseases in Plants Act No. 11 [*R.A.M.*, ix, p. 607]. Under the terms of this proclamation the removal or introduction of sugar-cane from or into any of these districts is prohibited, unless a permit has been issued by a qualified inspector.

Flor (H. H.). **Root rot troubles of the Sugar-Cane in Louisiana.**—*Louisiana Agric. Exper. Stat. Bull.* 212, May, 1930. [Abs. in *Facts about Sugar*, xxv, 27, p. 753, 1930.]

Root failure of sugar-cane in Louisiana appears, from the author's investigations, to be primarily due to a species of *Pythium* [probably identical with *P. arrhenomanes*: *R.A.M.*, ix, p. 271] which invades the tissues of the young roots and produces a soft rot with a collapse of the cells. The injury caused by the fungus has been found to be intensified by a soil insect, *Lepidocyrtus violentus* Folsom.

Leonian (L. H.). **Differential growth of Phytophthoras under the action of malachite green.**—*Amer. Journ. of Botany*, xvii, 7, pp. 671–677, 1930.

Malachite green [*R.A.M.*, ix, p. 206], at the rate of one part to 1, 2, 4, 8, and 16 million parts of nutrient solution [the composition of which is indicated], was used to induce differential growth in a number of *Phytophthora* species [ibid., ix, p. 135].

Three species, namely *P. colocasiae*, *P. richardiae* [ibid., vi, p. 616], and *P.* sp. 26 (a tropical species supplied by C. Hartley), failed to grow when malachite green was present at the rate of 1 in 16 million parts, while eight other strains (2 of *P. cactorum*, *P. cambivora* [ibid., ix, p. 353], *P. cryptogea*, 2 of *P. faberi*, *P. parasitica rhei*, and *P.* sp. 100 (tropical) made only sporadic growth. Twenty-one strains (including *P. erythroseptica*, *P. paeoniae*, and *P. pini*) [ibid., viii, p. 243] failed to develop when the amount of the dye was doubled, and 29 others (including *P. boehmeriae*, *P. citricolum* Sawada, *P. nicotianae*, and *P. palmivora*) only grew sporadically under these conditions. *P. hydrophila* was the only species able to make any growth in the presence of 1 part per million of malachite green.

The critical concentration of the dye for the *P. cactorum* group was found to approximate to 1 part per 4 million of malachite green, while that for the *P. omnivora* group is between 1 in 2 million and 1 in 4 million. There are clear indications that the dye may serve as a useful indicator for the classification of groups of more or less closely related species.

HIRATSUKA (N.). **Erster Beitrag zur Uredineen-Flora von Südsachalin.** [First contribution to the Uredineae flora of South Saghalien.]—*Mem. Tottori Agric. Coll.*, Tottori, Japan, i, 2, pp. 63–98, 1930.

Taxonomic and geographical notes are given on 106 species of rusts occurring in South Saghalien. A bibliography of 14 titles is appended, together with fungus and host indices.

HOPKINS (J. C. F.). **Field control of frenching in Tobacco.**—*Rhodesia Agric. Journ.*, xxvii, 6, pp. 581–586, 1930.

Following a severe outbreak, extending over some 40 acres, of tobacco frenching [*R.A.M.*, viii, p. 473] in Southern Rhodesia, where the disease is usually uncommon, tests were conducted in which rows of affected plants were given dressings of nitrate of soda at rates ranging from 25 to 150 lb. per acre, the plants in half the rows being cut down to soil level and only one sucker being allowed to grow. Other rows remained untreated as controls.

The growth of the treated plants rapidly improved, though many of those cut back appeared to have contracted mosaic during the operation, some 10 per cent. of the plants having originally shown the disease. Where the sucker growth of badly frenched plants was not checked, the leaves remained thin and narrow. Dressings of less than 45 lb. per acre were inadequate, but no special benefit resulted from using more.

Similar results were obtained in pot experiments with badly frenched plants transplanted into pots containing soil deficient in nitrogen. Plants cut back and given nitrogen made a strong growth of normal shoots, while those not cut back developed new stems with thin and narrow leaves.

It is concluded that frenching results from a deficiency of available nitrogen in the soil, and can be cured by the application of suitable fertilizers, whether physiologically acid or alkaline. The presence or absence of other plant foods has no relation to frenching, which apparently results from the raising of the carbohydrate-nitrogen ratio in the plant. This physiological change inhibits the development of the terminal bud while stimulating the growth of the lateral branches.

If the condition is severe, the plants should be cut down and only one sucker allowed to grow, the utmost care being taken to prevent contamination by mosaic during the operation.

PRICE (W. C.). **Local lesions on Bean leaves inoculated with Tobacco mosaic virus.**—*Amer. Journ. of Botany*, xvii 7, pp. 694–702, 2 figs., 2 graphs, 1930.

The results [which are tabulated and discussed] of inoculation experiments with the virus of tobacco mosaic on garden beans (*Phaseolus vulgaris*) showed that certain varieties develop local necrotic lesions when the upper surfaces are rubbed with juice containing the virus of the ordinary field type of tobacco mosaic [*R.A.M.*, ix, pp. 423, 496, 497]. A larger quantity of virus was recovered from bean leaves on which lesions occurred than from similarly inoculated leaves of immune varieties remaining free from lesions, indicating that a multiplication of the virus takes place in

the foliage of susceptible varieties, such as Scotia and Early Golden Cluster. Fewer lesions appear on leaves inoculated with dilute samples of the virus than on those inoculated with concentrated samples. Curves are presented indicating the possibility of using the number of lesions on susceptible bean varieties as a measure of virus concentration.

Fant (G. W.). **A control of angular leaf spot of Tobacco by spraying in the field.**—*Phytopath.*, xx, 6, pp. 527–529, 1930.

Very satisfactory control of angular leaf spot of tobacco [*Bacterium angulatum*] has been obtained in the Hertford and Bertie counties of North Carolina (where the disease is extremely severe on the susceptible Cash and Adcock varieties) by two applications of (*a*) Bordeaux mixture 4–5–50, using hydrated lime [*R.A.M.*, viii, p. 205], and (*b*) a mixture of zinc and hydrated lime (4–4–50) similar to that employed against *Bact. pruni* on peaches [ibid., viii, p. 727]. The first applications were given from 11th to 13th June, 1929, when the plants were scarcely knee-high, and the second between the 24th and 27th, when only a few of the plants had reached the topping or blossoming stage. Of the two sprays, Bordeaux mixture was the more effective, but in all the tests the improvement of leaf quality was more than sufficient to counterbalance the expense of labour and materials.

Angell (H. R.), Hill (A. V.), & Currie (G. A.). **Blue mould of Tobacco: progress report of studies on an insect vector.**—*Journ. Australia Council Sci. & Indus. Res.*, iii, 2, pp. 83–86, 1930.

During further investigations into the transmission of blue mould of tobacco [*Peronospora* sp.: *R.A.M.*, ix, p. 140] in Australia, when some 300 apparently healthy seedlings from the vicinity of Tumut, New South Wales, were transplanted to Canberra, it was noted a week later that a few of the transplants were affected by the disease, and that some of them were also attacked by the potato moth, *Phthorimaea operculella*; it was then learned that both the insect and the disease were also present in the original beds.

Tobacco seedlings at Canberra were then artificially inoculated with blue mould, and the disease was allowed to spread. Moths attacking the seedlings were collected and were found to carry an average of 15 conidia each. Under optimum conditions each of four moths taken from healthy plants and allowed to remain for two to three minutes on a freely sporulating blue mould lesion carried from 600 to 4,000 conidia.

Moths collected in the field were left for ten to fifteen minutes in a tube containing a tobacco seedling with fresh blue mould lesions bearing conidia; they were then placed on five- to seven-days old seedlings grown from clean seed in sterilized soil in Petri dishes, four to seven moths being introduced into each dish at intervals ranging from one minute to two hours after removal from the tube containing the infected material. Four to five days later several of the seedlings showed characteristic infections of the blue mould fungus.

As it was ascertained that *P. operculella* may live and fly for over a week, and that under suitable conditions of temperature and humidity the detached conidia of the blue mould fungus may remain viable for, and germinate after, 54 hours or more, the authors consider that the moth may be responsible for transporting inoculum from diseased overwintering plants and seedlings to healthy plants.

SHAPOVALOV (M.) & BEECHER (F. S.). **Experiments on the control of Tomato yellows.**—*U.S. Dept. of Agric. Tech. Bull.* 189, 23 pp., 4 pl., 1 fig., 1930.

A description is given of field experiments from 1926 to 1928, inclusive, at Riverside and Shafter, California, in the control of tomato yellows [*R.A.M.*, ix, p. 748] carried by the beet leafhopper *Eutettix tenella*. None of the sprays or dusts that were tried for the control of the insect proved of sufficient value to deserve recommendation, and only slight benefit resulted from measures intended to increase the vigour of the tomato plants, such as irrigation, the application of mineral fertilizers, green manuring, and the like. There was evidence that in certain localities the incidence of the disease may be slightly decreased by earlier or later planting, so as to have the plants as large as possible before the start of the leafhoppers' flight or to avoid this flight. The best results were obtained by shading with temporary muslin tents until the beginning of July, after which there is little or no further spread of infection; owing to its comparatively high cost, this method can, however, be recommended only in localities where the disease is severe and where tomatoes command high prices. The use of tall plants, e.g., sunflowers, for shading the tomatoes was also shown to be of considerable benefit, and may be adopted in places where the value of the crop does not warrant high expenditure.

Certain varieties of tomatoes were found to exhibit definite though not very strong resistance to the disease, and while the work of evolving new and more resistant varieties from these is continuing, the use of the present moderately resistant varieties with the aid of tents or shade crops is recommended as the best temporary measure of control.

MAY (C.). **The effect of grafting on resistance and susceptibility of tomatoes to Fusarium wilt.**—*Phytopath.*, xx, 6, pp. 519–521, 1930.

The results of reciprocal grafting experiments [details of which are given] between the Bonny Best and Norton tomato varieties, the former being highly susceptible to wilt (*Fusarium lycopersici*) and the latter relatively resistant [*R.A.M.*, vii, pp. 429, 811, *et passim*], indicated that the susceptible scion did not materially alter the reaction to the disease of the resistant stock, and conversely.

WEBER (G. F.). **Gray leaf spot of Tomato caused by Stemphylium solani, sp. nov.**—*Phytopath.*, xx, 6, pp. 513–518, 1930.

This is an expanded account of the *Stemphylium* leaf spot of

tomatoes in Florida, a preliminary notice of which has already been published [*R.A.M.*, viii, p. 410]. The disease, which occurs in a most destructive form in widely separated sections of the State, is characterized in the seed-bed by marked defoliation of the plants without conspicuous yellowing. The latter symptom, however, develops extensively in the field, where the plants also exhibit the typical grey spots, surrounded by a yellowish halo, which ultimately dry out and crack from side to side, forming various patterns. The dark, septate, unbranched (except in old cultures) conidiophores of the fungus (which is named *S. solani* n. sp., with an English diagnosis) develop on the blackish margins of the spots on both leaf surfaces; they measure 130 to 200 by 4 to 7 μ and produce acrogenously (or pleurogenously in old cultures) muriform, fuscous to very dark, oblong-rectangular conidia, with several longitudinal and transverse septa, and measuring 48·08 by 22·43 μ (45 to 50 by 20 to 23 μ in 50 per cent. or more).

NATTRASS (R. M.). **A note on two Marssonina diseases on Willows.**—*Min. of Agric., Egypt* (*Plant Protect. Sect.*), *Bull.* 99, 19 pp., 18 pl., 1930.

This is a detailed account of two *Marssonina* diseases of willows, one occurring in the northern regions of the Nile Delta, some fifty miles from the sea, and the other at Long Ashton, Bristol.

In the low-lying lands of the Nile Delta *Salix tetrasperma* is liable to severe injury from a leaf spotting disease, which may also involve the twigs and inflorescences during the early part of the year. In the summer the reddish to dark brown spots, with greyish centres and pitch-black margins, 1 to 3 mm. in diameter, are found chiefly on the upper surface, but in the early spring they may also occur on the under sides. The lesions may become confluent and cover a large area of the leaf surface. The acervuli are either minute white spots (130 to 150 μ in diameter) scattered over the surface of the lesions, or form a single larger dot (up to 650 μ in diameter) in the centre of a small spot. Very early infection may be recognized on the young leaves by the development of minute pitch-black spots, 0·5 to 1 mm. in diameter, each with a single large, white acervulus in the centre. The occurrence of a number of such spots may arrest the growth of the leaf and cause malformation. The grey to reddish-brown spots occurring on the under surface are minute and usually crowded, normally round and with circular acervuli but occasionally irregular with large scutiform acervuli. The lesions on the petioles and young, succulent portions of the twigs are similar to those on the leaves.

The conidia of the fungus are hyaline, clavate, or piriform, generally curved, and uniseptate, the basal cell being much smaller than the upper one. They measure 13 to 17 by 4 to 7 μ. On prune extract-agar at 18° C. a single conidium, after three months, produced a pitch-black, sclerotioid mass of tissue, with a narrow, pale pinkish-cinnamon margin. Conidia are produced in abundance over the surface of the growth in white or clear globular masses.

Inoculations [details of which are given] with conidial suspen-

sions of the fungus on leaves of *S. tetrasperma* gave positive results infection occurring with equal readiness on wounded and unwounded tissues. Young, succulent stems and mature, woody ones were similarly inoculated. In the latter case the disorganized cells were filled with a gummy substance which completely obscured the hyphae. The characteristic symptoms of the disease appeared in eight days, on leaves kept moist for 48 hours after inoculation, acervuli being formed eleven days later. The conidia from these acervuli were larger and straighter than those previously obtained from the north of the Delta, measuring 15 to 18·6 by 6·6 to 7·5 μ.

Rods of the Red Welsh variety of *S. purpurea* at Long Ashton were observed in 1926 [*R.A.M.*, vi, p. 529] to show circular or elliptical lesions, 2 to 4 mm. in diameter, pitch-black when young with one or more pustular acervuli in the centre. The latter ultimately rupture and a whitish spot is formed which increases in size, exposing the underlying tissue. Finally the lesion becomes a slightly sunken area with a raised pale centre and a raised dark brown or black rim. Such lesions are mostly confined to the stems, but they occasionally occur on the under surface of the mid-rib of the leaves.

The circular or elliptical, sometimes confluent acervuli, measuring 160 to 400 μ in diameter, contain clavate or piriform, straight or slightly curved, hyaline, uniseptate conidia, 14 to 19 by 4 to 7 μ, the basal cell being much smaller than the upper one. Growth on artificial media was extremely slow. The conidia produced in culture are slightly larger than those occurring in nature (up to 24 μ in length). The culture eventually becomes a black, encrusted growth of sclerotioid tissue with a white margin.

Inoculation experiments [details of which are given] with conidial suspensions and mycelium of the fungus resulted in the development of the typical symptoms on wounded, but not on unwounded rods.

The taxonomy of the species of *Marssonina* responsible for these diseases is fully discussed, the conclusion being reached that the Egyptian fungus is identical with *M. kriegeriana* (recorded by Reichert in ' Die Pilzflora Ägyptens ', p. 122, 1921, as occurring on *Salix* spp. near Alexandria), and the English one with *M. salicicola*. Such differences as exist between these two organisms appear to lie rather in the shape of the conidia than in their size or the nature of the lesions, and they may eventually be shown to be identical, but pending further critical work it is considered advisable to regard them as distinct species.

ZELLER (S. M.) & GOODDING (L. N.). **Some species of Atropellis and Scleroderris on conifers in the Pacific Northwest.**— *Phytopath.*, xx, 7, pp. 555–567, 1 pl., 2 figs., 1930.

The authors discuss at some length the distribution, economic importance, pathogenicity, and taxonomy of various species of *Atropellis* (a new genus of the Tryblidiaceae, differing from *Scleroderris* in its non-septate spores and coloured paraphyses and hymenium, and represented by *A. treleasei* and *A. pinicola*, dia-

gnoses of which are given) and *Scleroderris* causing diseases of conifers in Oregon, Washington, and British Columbia.

An apparently undescribed fungus, which the authors name *A. pinicola*, has been found killing numerous twigs and branches on western white pines (*Pinus monticola*) 4 to 40 ft. high [*R.A.M.*, vii, p. 494]. The largest trunk cankers reported were about breast-high on trees 3 to 5 inches in diameter. On the smaller branches, as well as on larger ones, sunken cankers often occur only on one side, and during the spring the bark on the last two years' growth of the cankers is usually profusely spotted with the black apothecia of the fungus. The black stromata of what is believed to be the imperfect stage may be seen on the third year's growth. The same organism was also found once on *P. contorta*. An apparently undescribed species of *Scleroderris*, which the authors name *S. abieticola*, attacks *Abies grandis* and (apparently to a much slighter extent) *A. amabilis*. Cankers of varying size have been found on the twigs, branches, and trunks of trees up to 4 inches in diameter, but as there is no indication of their extension after the first year, the economic importance of infection on this host cannot be compared with that occurring on pines.

Infection of *P. monticola* apparently takes place in the autumn or early winter through uninjured bark or leaf scars. *A. grandis* and *A. amabilis* also seem to be infected through unwounded bark or leaf scars. On *A. grandis* the apothecia of *S. abieticola* are developed during the summer of the first year after canker formation. The young cankers are very smooth and of a reddish-brown colour, but older ones are frequently sunken and cracked.

The fungus formerly known as *S. treleasei* (collected on *Picea sitchensis* in 1899) is also referred to the genus *Atropellis*. The imperfect stage usually associated with *A. pinicola* is believed to be a *Fuckelia* (apparently the first recorded on conifers) which, if finally demonstrated to be distinct from *A. pinicola*, should be known as *F. pinicola* Zeller & Goodding. The ascospores of *A. treleasei* and *A. pinicola* measure 42 to 60 by 2 to 2·5 μ and 32 to 63 by 1·5 to 3·5 μ, respectively, and the conidia of *F. pinicola* 8 to 11 by 1·7 to 3 μ.

Flachs (K.) & Kronberger (M.). **Zum Kohlhernieproblem.** [On the problem of finger-and-toe of Cabbage.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, viii, 4, pp. 75–80; 5, pp. 106–115, 6 figs., 1930.

The results [which are fully described] of experiments conducted near Munich in connexion with the study of finger-and-toe of cabbage [*Plasmodiophora brassicae*: see above, p. 755] showed that excessive applications of stable manure cause a marked disturbance in the balance of the different types of soil micro-organisms. The hydrogen sulphide accumulating as a result of this treatment primarily affects the numbers of the nitrogen-fixing, free-living bacteria, and the estimation of these afforded a useful measure of the intensity of finger-and-toe infection. The reduction in the activity of the conversion processes in the soils under discussion favours the development of finger-and-toe.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iii, 1, pp. 2–5, 6–7, 11–17, 29, 36–43, 46–47, 1930.

Germany. As from 15th March, 1930, potatoes imported into Germany must be accompanied by a certificate, signed by the responsible authorities, vouching for the freedom of the consignments from wart disease (*Synchytrium endobioticum*), and stating that the fungus was not present within a radius of 2 km. from the field in which the plants were cultivated. This Order supersedes that of 4th June, 1925 [*R.A.M.*, v, p. 64]. The text of recent Orders governing the control of wart disease in Saxony, Thuringia, Gotha, and Hamburg is quoted.

In order to exclude fungous parasites of conifers, the importation into Germany of *Abies*, *Picea*, *Pseudotsuga*, and *Tsuga* plants or parts thereof is prohibited as from 3rd June, 1930.

Guinea. By virtue of Orders dated 13th and 19th September, 1929, the importation into Spanish territories of the Gulf of Guinea of twigs, cuttings, roots, &c., for the cultivation of any species of banana is prohibited. Living plants of all kinds or parts thereof, soil, packing, &c., may be imported only by way of Santa Isabel de Fernando Po, and must be accompanied by a duly accredited certificate guaranteeing their freedom from pests and diseases. The Governor-General may order the inspection of such plants, any of which adjudged injurious will be destroyed without compensation, and a fine of 1,000 to 10,000 pesetas imposed on the consignee.

Jugo-Slavia. The provisions of the Order relating to the control of diseases and pests of cultivated plants in Jugo-Slavia (9th December, 1929) are cited. The duties of landowners, agricultural experiment stations and similar institutions, and municipal authorities in relation to the Order are defined and penalties for infringements prescribed. The Minister of Agriculture is empowered to prohibit the import and transport of seeds or other reproductive parts of plants suspected of infection by insect pests or fungous diseases, with special reference to potato wart.

Dutch East Indies. An Order of the Director of Agriculture Industry, and Commerce in Buitenzorg (21st October, 1929, published 5th December, 1929) provides for the exclusion from the Dutch East Indies of any potato consignments unaccompanied by a duly authenticated certificate of freedom from wart disease, infection by which must further not have been observed within a radius of 500 m. from the place of cultivation.

Norway. In order to avoid the introduction into Norway of the fungus *Graphium ulmi* [*R.A.M.*, ix, p. 499], the importation of elm seedlings (any species of *Ulmus*) is prohibited as from 22nd March, 1930.

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